ENERGY ENGINEERING ANALYSIS PROGRAM (EEAP)

ENERGY SAVINGS OPPORTUNITY SURVEY FORT RICHARDSON, ALASKA

Volume I: Executive Summary

Prepared for

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PREFACE

The final report of this Energy Savings Opportunity Survey, provided as part of the Energy Engineering Analysis Program for Fort Greely, Fort Richardson and Fort Wainwright, Alaska, is organized as a separate report for each installation. The Fort Greely and Fort Richardson reports each consist of five volumes, while the Fort Wainwright report is made up of four volumes.

Volume I, ***Executive Summary***, briefly summarizes the findings and recommendations of the study, presenting the information in comparative terms.

Volume II, ***Report***, reiterates the ***Executive Summary*** and provides a description of the scope of the study and of the methods and approach used in collecting and analyzing data. It also contains a more detailed discussion regarding the findings and recommendations for Energy Conservation Opportunities, project development, operations and maintenance considerations, as well as Low Cost/No Cost projects recommended for implementation.

Volume III, ***Documentation***, consists of the documentation forms and supporting information to present funding requests for projects developed by this study.

Volumes IV and V, ***Appendices***, contain the calculations and reference material supporting the report documentation. Appendix 1 contains the ***Scope of Work*** contracted for performance of this study. It should be noted that a revision to the Scope of Work, expanding the study, follows the original document. Appendix 2, ***ECO 45 Introduction***, serves as a comprehensive reference point for analysis of applying pipe insulation. When this ECO is examined in the buildings under study, the reader may be referred to this section. Appendices 3 through 39 document the analyses performed for each ECO and building combination. Each building is contained in a separate appendix.

ENERGY ENGINEERING ANALYSIS PROGRAM

ENERGY SAVINGS OPPORTUNITY SURVEY
FORT RICHARDSON, ALASKA

Volume I: Executive Summary

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ENERGY SAVINGS OPPORTUNITY SURVEY
FORT RICHARDSON

EXECUTIVE SUMMARY

1. INTRODUCTION

1.1 Authorization

This Energy Savings Opportunity Survey (ESOS) of select facilities at Fort Richardson is provided as part of the Energy Engineering Analysis Program (EEAP). Similar studies were undertaken concurrently for Fort Greely and Fort Wainwright and are contained in separate reports. The study was initiated 30 September 1986. From August 1987 through May 1988 the project was temporarily suspended until a revised Scope of Work was issued.

1.2 Purpose

The EEAP is a series of studies intended to identify energy conservation opportunities (ECOs) which will result in the optimum use of energy resources available. The overall purpose of this study was to identify means to save energy through investment in the application of energy conserving technologies. This objective was approached by the evaluation of pre-identified ECOs within specified buildings that might yield positive economic return to the Government, if undertaken, and that would fit within the constraints of several funding programs available to the Department of the Army.

1.3 Scope

The Fort Richardson study was limited to examination of 61 ECOs as they may apply to one or more of 37 buildings, or portions of buildings, specified by the Scope of Work. The Scope of Work also called for technical audit and analysis of two of the 37 buildings: the Commissary and Post Exchange Complex (Building 5) and the Laundry Facility (Building 726).

The original scope included complete energy analysis of kitchens and dining facilities. In order to meet the financial constraints of this study, the requirement to perform formal energy audits of these facilities was deleted in favor of the analysis of specific ECOs as they might be applied to kitchens and dining facilities. The mess hall portion of the stipulated buildings was, therefore, analyzed separately. These building areas are identified by the suffix "D" on the building number.

1.4 Summary of Results

In all, 657 separate ECOs were examined. Of that number, 144 (22%) are recommended for implementation. Of the 144 recommended ECOs, 68 were combined into 15 separate packages, and appropriate documentation was developed. Table 1 summarizes some features of the developed projects.

TABLE 1. SUMMARY OF DEVELOPED PROJECTS

Developed Project Funding Source and Description	Steam Energy Savings (MBTU)	Elect. Energy Savings (KWH)	Annual Energy Savings ($)	FY87 Savings/ Investment Ratio	FY87 Simple Payback	QRIP FY90 Payback	Programmed Year Project Costs
QRIP PACKAGE #1: Energy - Economizer Cycles	1,257	0	3,104	30.13	0.62	0.46	2,233 (1)
QRIP PACKAGE #2: Energy - Revise Controls	27,185	261,450	79,596	32.31	0.53	0.42	49,288 (1)
QRIP PACKAGE #3: Energy - PX HVAC Controls	86	63,388	3,230	13.04	0.78	0.89	2,762 (1)
QRIP PACKAGE #4: Energy - Night Setback	4,667	0	11,527	34.03	0.56	0.42	7,158 (1)
OMA-L PACKAGE #1: Replace Fluorescent Ballasts for Energy Conservation	0	117,766	5,607	1.84	6.05		53,898 (1)
OMA-L PACKAGE #2: Incadescent to Fluorescent Lights for Energy Conserv.	0	88,088	4,194	3.00	3.66		33,953 (1)
OMA-L PACKAGE #3: Hot Water Generation Control for Energy Conservation	37	2,062	188	1.91	7.24		1,598 (1)
OMA-L PACKAGE #4: Night Setback Heating for Energy Conservation	12,911	0	31,891	6.26	3.68		92,984 (1)
OMA-L PACKAGE #5: Pipe Insulation for Energy Conservation	417	0	1,031	7.32	3.10		3,736 (1)
OMA-L PACKAGE #6: Lighting Occupancy Sensors for Energy Conservation	0	216,167	10,292	1.55	6.13		73,828 (1)
OMA-L PACKAGE #7: Replace PX Fluor. Ballasts for Energy Conservation	0	128,415	6,114	1.11	9.93		125,006 (1)
OMA-L PACKAGE #8: Improve HVAC Controls for Energy Conservation	1,105	0	2,729	3.84	5.13		14,558 (1)
OMA-L PACKAGE #9: Refrig Case Seals & Incand to Fluor Lights for Energy	0	13,127	625	1.44	6.30		5,735 (1)
LOW COST/NO COST #1: Reduce Space Temperature in Winter	697	0	1,721	29.81	1.06		1,128 (2)
LOW COST/NO COST #2: Replace Std Fluor Lamps w/ Energy Saving Lamps	0	132,342	6,301	2.79	2.86		19,780 (2)

NOTES: (1) Programmed Year of FY90
(2) Programmed Year of FY89

Four projects identified for development qualify under the QRIP portion of the Productivity Capital Investment Program and appropriate documentation was developed. In addition, nine projects were identified which can qualify for OMA-L energy project funds and documentation for that program is also included. Two projects were identified for Low Cost/No Cost implementation. No projects qualify for application of ECIP, OSD PIF or PECIP funds.

1.5 Maintenance Recommendations

Maintenance ECOs were dealt with separately from the ECOs referenced above. Discussion of these ECOs was developed in conjunction with other maintenance considerations.

During the execution of the project, over 200 engineer field hours were consumed analyzing ECOs on site. Along with the information explicitly required of the Scope of Work, field engineers could not help but notice evidence of operations and other non-energy related system upgrades that could prove cost effective, or enhance the effectiveness of the mission, if implemented.

Maintenance delivery systems utilized to maintain the Government facilities located at Fort Richardson could be measurably improved. Preliminary analysis indicates that the effectiveness of these systems could potentially be increased by 30%. Thus, we recommend a Fort-wide, comprehensive analysis of all maintenance delivery systems. Such a project should include analysis of purchasing, warehousing, personnel training, and upkeep of maintenance information.

Such an analysis, if targeted at Fort Richardson alone could require as much as 1,500 professional man-hours of effort. If undertaken as a part of a comprehensive Alaska District project, the Fort Richardson element could be much reduced because of economies of scale and similarity of systems from Fort to Fort.

2. BUILDING DATA

This project has been concerned with the performance of energy consuming systems in 37 selected buildings or discrete portions of buildings. Table 2, Buildings Investigated, lists the building number, type, gross area and the year constructed of the buildings investigated during the execution of this contract. In all, this work addresses some 2,375,000 square feet of built space constructed to provide a variety of functions.

Fort Richardson is located in Southcentral Alaska, northeast of Anchorage at the northern end of Cook Inlet. The location is sub-Arctic and maritime. It is typified by cold winters and cool, wet summers. All functions necessary to support the men and women assigned to the Fort are contained within its confines; the Fort is a self-sufficient community. The bulk of the facilities that make up the Fort were constructed between 1950 and 1955. Facilities have been added over the years since that time, but construction methods and building systems employed are, by and large, typical of 1950's technology; now 35 years old.

Summary information concerning the applications of various ECOs within various buildings is contained in a number of tables displayed in Section 5 of this Executive Summary.

TABLE 2. BUILDINGS INVESTIGATED
Fort Richardson

BLDG	DESCRIPTION	GROSS SQ. FT.	YEAR BUILT	
1	ARMY HQ BLDG.	126570	1952	
5	COMMISSARY/PX	139741	1958	
56	OPEN MESS OFF	45219	1955	
600D	EM BKS W/ MESS	134820	1949	
602A	EM BKS W/ MESS	105412	1951	(1)
602D	MESS ONLY-602	9000	1951	(1)
620	EM BK W/O MESS	41912	1952	(3)
622	EM BK W/O MESS	41912	1952	(3)
624	EM BK W/O MESS	41912	1952	(3)
626	EM BK W/O MESS	41372	1952	(2)
628	EM BK W/O MESS	41372	1952	(2)
630	EM BK W/O MESS	41372	1952	(2)
632	EM BK W/O MESS	41912	1952	(3)
640A	EM BKS W/MESS	106387	1952	(1)
640D	MESS ONLY-640	9000	1952	(1)
650A	EM BKS W/MESS	105235	1952	(1)
650D	MESS ONLY-650	9000	1952	(1)
655	OPEN MESS NCO	42450	1957	
658	GEN PURP ADMIN	43435	1949	
660	EM BK W/O MESS	41912	1951	(3)
662	EM BK W/O MESS	41912	1951	(3)
664	EM BK W/O MESS	41372	1951	(2)
666	EM BK W/O MESS	41372	1951	(2)
668	EM BK W/O MESS	41372	1951	(2)
670	EM BK W/O MESS	41372	1951	(2)
690	FIELD HOUSE	63485	1952	
724	GEN PURP WHS	161785	1955	
726	FIXED LAUNDRY	59228	1953	
740	FE MAINT SHOP	26015	1954	
760	VEH MAINT SHOP	25843	1952	
784	VEH MAINT SHOP	26131	1952	
802	GEN PURP WHS	200998	1952	(4)
804	GEN PURP WHS	207452	1952	(4)
808	COLD STORE WHS	112355	1952	
908	PRINT SHOP	16686		
47430	MNT HANGAR AV	21969	1958	
47431	MNT HANGAR AV	36037	1968	

(1) These are identified by the Scope of Work as "identical buildings;" Bldg. 602 study applied to all.
(2) These are identified by the Scope of Work as "identical buildings;" Bldg. 628 study applied to all.
(3) These are identified by the Scope of Work as "identical buildings;" Bldg. 624 study applied to all.
(4) These are identified by the Scope of Work as "identical buildings;" Bldg. 804 study applied to all.

3. PRESENT ENERGY CONSUMPTION

Fort Richardson is served with a mix of energy sources. District steam (100 psi at 325°F.) and electricity is produced by a government-owned, natural gas fired cogeneration plant. The Anchorage Municipal Light and Power Company has an agreement with the government to purchase from, and sell electricity to, the government. Enstar Natural Gas Company provides natural gas fuel to the cogeneration plant and some individual facilities.

Figure 1, Present Energy Use, summarizes the energy consumption associated with developed ECOs. When reviewing the values of energy consumed, the reader is reminded that the work reported upon herein was focused on specific, energy consuming **building systems**, as contrasted with total energy consumed by the facility under study. For example, when analyzing the advisability of insulating steam piping, the analysis was focused on calculation of energy wasted to the surroundings before and after the steam pipe was insulated. Since the heat transmitted from the steam source to the steam appliance, through the steam pipe, was assumed to be unaffected by application of the ECO, transmitted heat is not accounted for in the analysis, nor is it reported herein.

This consideration is also important when examining energy consumption by system as in Table 3 and Figure 2. Table 3 lists the present energy consumption of systems for which ECOs were developed. In presenting this information here, ECOs dealing with similar systems have been grouped together, e.g., those dealing with building insulation are accumulated under Building Envelope, while those dealing with various HVAC systems controls have been totaled as Mechanical Air Systems. Figure 2 graphically presents this data for each type of system as a percentage of the total.

TABLE 3. PRESENT ANNUAL ENERGY CONSUMPTION BY SYSTEM*

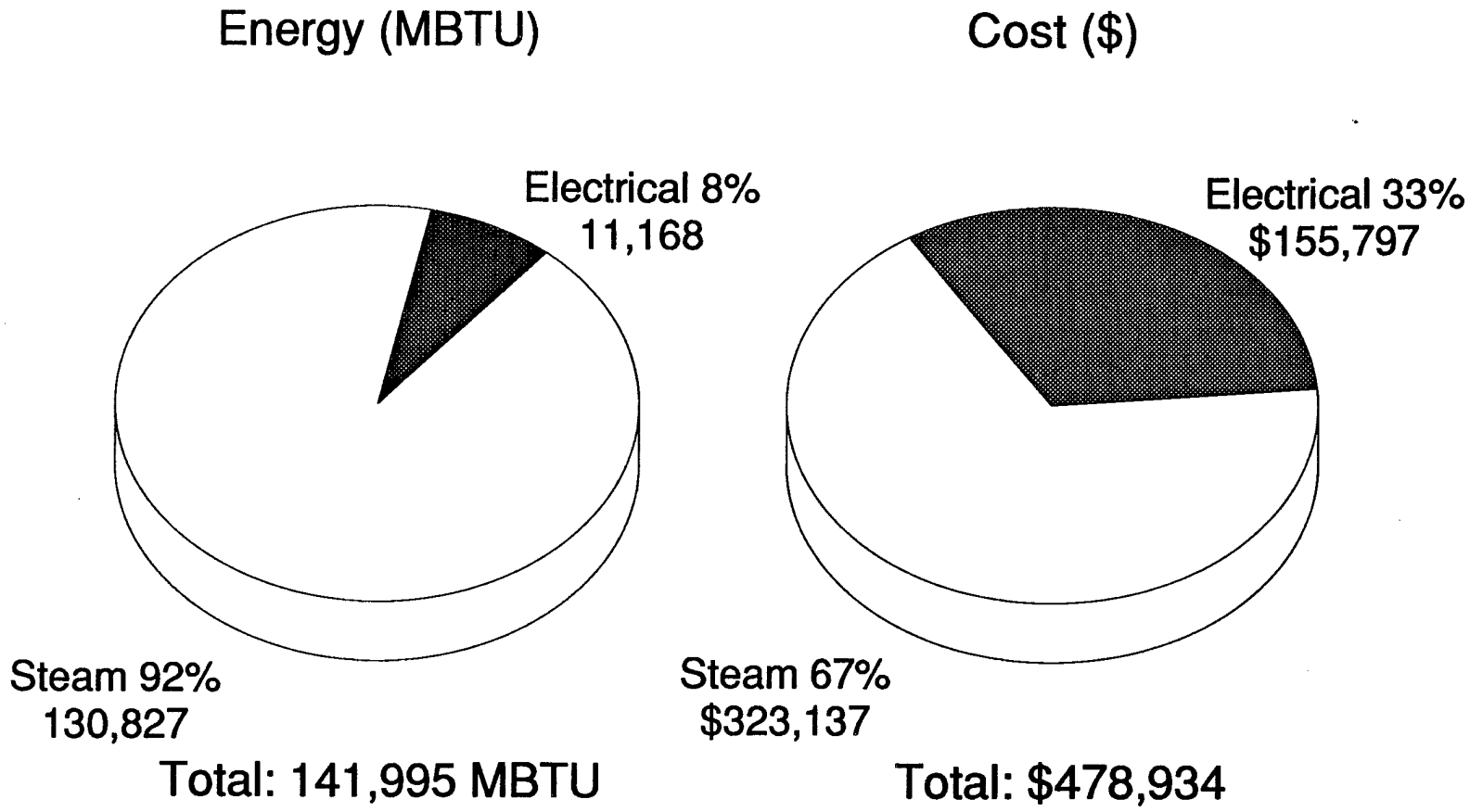
SYSTEM	ELEC ENERGY (KWH)	ELEC ENERGY (MBTU)	ELEC COST ($)	STEAM ENERGY (MBTU)	STEAM COST ($)	TOTAL EL&ST ENERGY (MBTU)	TOTAL COST ($)
Refrigerator Seals	9,636	33	459	0	0	33	459
Mechanical Air Systems	562,246	1,918	26,763	130,187	321,555	132,105	348,318
Mechanical Water Heating Systems	4,946	17	236	158	391	175	627
Heated Fluid Piping Systems	0	0	0	482	1,191	482	1,191
Electrical Systems	2,695,690	9,200	128,339	0	0	9,200	128,339
TOTALS	3,272,518	11,168	155,797	130,827	323,137	141,995	478,934

* Present energy consumption related to developed projects.

FIGURE 1

Present Annual Energy Use*

Fort Richardson



* Present Energy Consumption Related to Developed Projects

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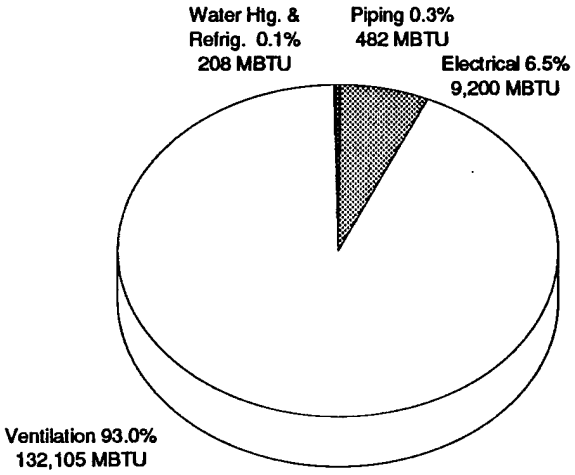
FIGURE 2

Present Annual Energy Use By System*

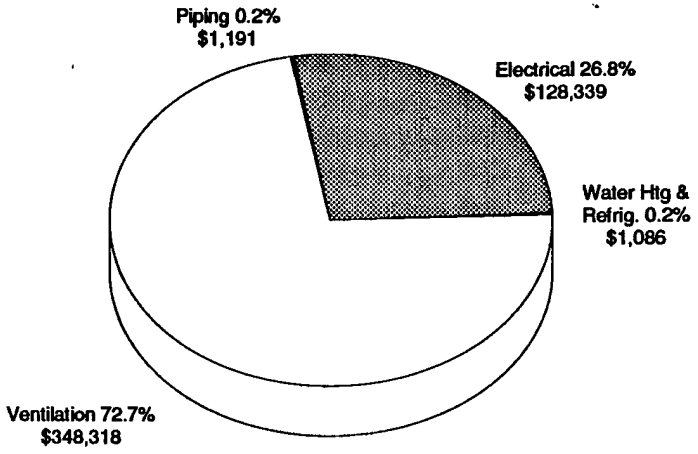
Fort Richardson

Energy (MBTU)



Total: 141,995 MBTU

Cost ($)



Total $478,934

* Present Energy Consumption Related to Developed Projects

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4. HISTORICAL ENERGY CONSUMPTION

Since the focus of this study was on specific building systems that consume energy, no historic data was available because such systems are not metered. In fact, individual buildings are not equipped with steam, condensate or kilowatt-hour meters, thus measuring energy consumption at individual buildings is not possible at this time. Furthermore, because of the structure of the Scope of Work, estimates of past energy consumption for the various buildings would be of only academic value to the work reported upon here. Therefore, historical energy consumption was not estimated, nor is it reported upon herein.

5. ENERGY CONSERVATION ANALYSIS

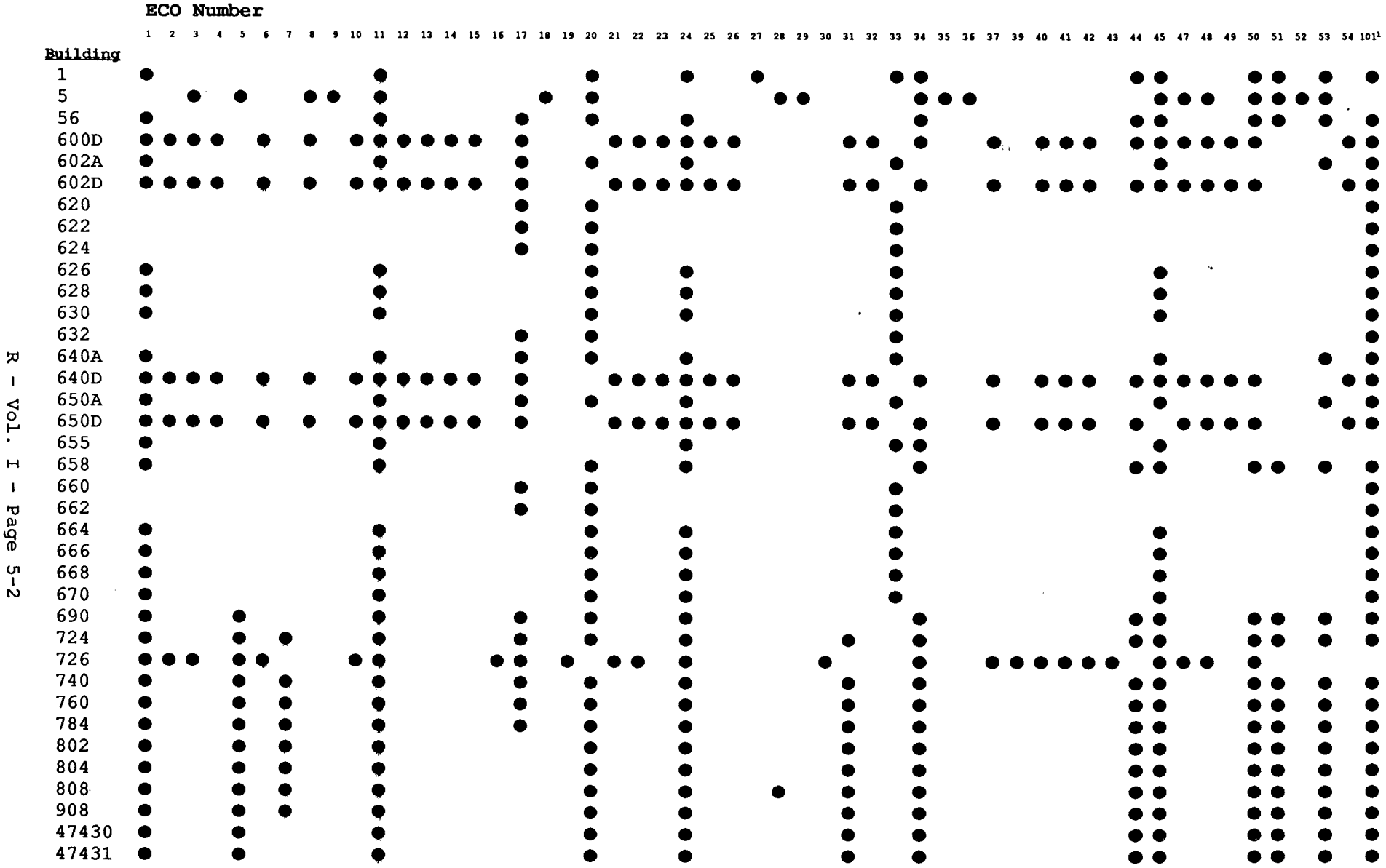
A total of 657 separate ECO analyses were carried out during the analysis of building systems serving 37 buildings or discrete portions of buildings. On average, about 18 separate ECO analyses were performed for each building.

5.1 ECOs Investigated

Table 4, Investigated ECOs, correlates the buildings to each ECO investigated. Following that Table is a descriptive listing which provides summary definitions of each ECO.

It should be noted that, as indicated on Table 4, only 461 ECO/building intersections required evaluation. However, 657 separate analyses were conducted. The reason for the disparity lies in the fact that separate analysis of the same ECO was carried out in more than one point in many buildings. For example, the analysis associated with insulation of a 4-inch steam main was separated from the analysis of insulation of a 2-inch hot water line. Thus, multiple analyses were carried out for one ECO; for example, "ECO 45, Insulate Piping," in some cases may have involved up to ten analyses (subtitled ECO 45 A through J). As previously stated, maintenance ECOs received separate treatment from those listed in the Table, and are discussed in conjunction with other maintenance considerations.

TABLE 4
Investigated ECOs Summary
Fort Richardson



Note: 1. ECO 101: For buildings in which ECO 20, 34 or 44 has been analyzed, the related portion of ECO 101 will not appear as a separate analysis.

5.1.1 ECO Definition Summary

The following listing provides summary descriptions, preceded by the ECO number and name assigned, of each ECO investigated at Fort Richardson.

BUILDING ENVELOPE & ARCHITECTURAL ECOs

01 Insulate Walls and/or Roof

The thermal efficiency of the building envelope may be economically enhanced by adding or replacing roof and/or wall insulation.

01A Insulate walls above ground; 3' pre-fab wall panels, flashings

01B Insulate below grade walls; 3" polystyrene insulation, insulation guard

01C Insulate walls above ground; R-13 batt insulation, vapor barrier, 5/8" gypsum board, 4" rubber base

01D Insulate roof; flood coat roof, 4" rigid insulation, concrete pavers, raised roof curbs

01E Insulate roof; 4-ply built-up roof, R-30 batt insulation, flashing, cants

01F Insulate roof; 2" X 4" vertical supports and bracing, 2" X 6" ceiling joists, R-30 batt insulation, vapor barrier, gypsum board

01G Insulate roof; R-30 batt insulation, vapor barrier

01H Insulate roof; pre-fab roof panel, flashing

01I Insulate roof; 2' x 4' vertical supports and bracing, ceiling joists, R-30 batt insulation, vapor barrier, plywood

02 Install Double Glazings

The thermal efficiency of the building envelope may be economically enhanced by replacing existing glazing units with more thermally efficient double glazed units.

02A Install double glazings; replace set of nine 2'-2" X 3'-11" single-glaze, triple-hung windows with double-glazings

02B Install double glazings; replace set of six 2'-2" X 3'-11" single-glaze, triple-hung windows with double-glazings

03 Replace Windows with Insulating Panels

The thermal efficiency of the building envelope may be economically enhanced by removing some existing glazing units and extending the existing envelope construction over the location previously occupied by those glazing units.

03A Replace windows with insulating panels; replace single-glaze window with metal frame (R = 1.13)

03B Replace windows with insulating panels; replace glass block

03C Replace windows with insulating panels; replace double-hung, single-glaze window with storm window (R = 1.94)

03D Replace windows with insulating panels; replace single-glaze window with storm window (R = 1.94)

04 Reduce Glass Area

The thermal efficiency of the building envelope may be economically enhanced by removing some existing glazing units and extending the existing envelope construction over the location previously occupied by those glazing units.

05 Prevent Air Stratification

The heat loss through the roof may be economically reduced by reducing the temperature gradient that frequently develops in poorly mixed room air.

06 Vestibules

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at frequently used exterior doors. Such results can frequently be achieved through the addition of vestibules.

07 Loading Dock Seals

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at frequently used exterior doors. Such results can frequently be achieved through the addition of loading dock seals that effectively form a gasket between truck trailers and overhead doors in areas where freight is shipped and received.

08 Air Curtains

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at frequently used exterior doors. Such results can frequently be achieved through the addition of air curtains.

09 Plastic Strips at Refrigerator Cases

The thermal efficiency of refrigerated display cases may be economically enhanced by reducing infiltration of room air into the case by placing transparent plastic strips over the opening into the case.

10 Plastic Strips at Personnel Doors

Installation of heavy plastic strips over door openings either between the built space and the out of doors or between cold storage space and storage or circulation space characterized by warmer temperatures can frequently and economically reduce infiltration of cold air into heated spaces and vice versa.

11 Weather Stripping and Caulking

The thermal efficiency of the building envelope may be economically enhanced by reducing infiltration of cold outside air at windows, doors and construction penetrations in the envelope.

11A Weatherstrip and caulk 3'-0" X 7'-0" personnel doors

11B Weatherstrip and caulk 14'-0" X 13'-6" overhead doors

11C Weatherstrip and caulk 8'-0" X 8'-0" overhead doors

11D Weatherstrip and caulk 10'-0" X 10'-0" overhead doors

11E Weatherstrip and caulk fixed windows

11F Weatherstrip and caulk double-hung wood-frame windows

11G Weatherstrip and caulk awning wood-frame windows

11H Weatherstrip and caulk wood-frame casement windows

12 Solar Film

The application of solar film to windows can reduce solar heat gains in sunlit spaces. Such a reduction in heat gain can reduce air conditioning loads.

13 Thermal Storage

In cases where more waste heat may be recovered than can be economically used at the time of recovery, the use of the architectural features of the building may allow for economical energy savings.

MECHANICAL AIR SYSTEMS

14 Reclaim Heat From Kitchen Exhaust

Kitchens exhaust large quantities of grease and smoke laden hot air. Heat may frequently and economically be extracted from the exhaust air and used to preheat fresh outside make-up air.

15 Reclaim Heat From Kitchen Equipment

Kitchen equipment consumes large amounts of energy. Heat radiating from cookers, for example, and wasted in hot wash water going down the drain may, on occasion, be economically recovered.

16 Reclaim Heat From Laundry Equipment

Laundry equipment consumes large amounts of energy. Heat wasted in hot wash water going down the drain may be economically recovered to provide space heat.

17 Reclaim Heat From Ventilation Air

Buildings often exhaust large quantities of warm air. Heat may frequently and economically be extracted from the exhaust air and used to preheat fresh outside make-up air.

18 Return Air from Refrigerated Display

The condenser, of refrigeration systems, reject 2 to 4 times the amount of heat taken from the refrigerated space or process. This source of heat may be economically recovered and used elsewhere.

19 Reclaim Heat from Dryer Equipment

Laundry dryers consume large quantities of energy. Heat contained in the dryer exhaust may frequently and economically be recovered.

20 Revise/Replace HVAC Controls

Controls, in many buildings, may be defeated by occupants untrained in controls maintenance, may be inappropriate to serve the requirements of changing occupancy and/or facility management guidelines, or may be in need of substantial repair or renovation. Such problem controls systems are frequently the cause of wasted energy.

21 Upgrade HVAC Equipment

As time passes and use patterns change, the load imposed on HVAC equipment is often subject to change. This ECO requires review of HVAC equipment to determine is energy can be saved by equipment replacement or derating through modification.

22 Convert Ventilation Systems to VAV

Many ventilation systems in older buildings provide fixed quantities of air while varying the temperature of the air to meet comfort requirements of the ventilated spaces. In recent years, variable air volume (VAV) systems have been proven to be more energy conservative than the old constant volume systems. It is often economical to convert constant volume systems to VAV configurations.

23 Install Kitchen Make-Up Air Units

For every pound of air exhausted from a kitchen hood system, a pound of fresh make-up air must be provided to the kitchen space. If an engineered make-up air system is not provided, make-up air will come from infiltration through the building envelope. It is frequently economical to provide an engineered make-up air system that utilizes waste heat recovery from the kitchen hood exhaust.

24 Duct Insulation

Insulating ducts in forced air heating and ventilation systems mitigates energy loss. This retrofit measure often times may be economical.

25 Shut Off Kitchen Hood Fan When Not in Use

It is not energy conservative to operate kitchen hoods when kitchen equipment is not in use.

26 Economizer Cycles

The term "economizer cycle" typically refers to a feature of an air conditioning machine which allows, under specified conditions, variable amounts of outdoor air to be introduced into the system so as to minimize energy consumed by the mechanical refrigeration system. In this case, however, since there is very little mechanical refrigeration used in air conditioning in Alaska, the term "economizer cycle" is used to describe a system of controls that enables the energy optimization of the introduction of outdoor air into the ventilation system.

101 Install Timeclocks - All Systems

Energy consumption can be reduced by shutting down or reducing temperature setpoints of HVAC, building heating and domestic hot water heating systems during unoccupied periods. This ECO looks at accomplishing ECO 20-Revise/Replace HVAC Controls, ECO 34-Night Setback/Setup Thermostats, ECO 44-Shut off Energy to Hot Water Off Use, by installing a timeclock to control systems. ***Note: For buildings in which ECO 20, 34 or 44 has been analyzed, the related ECO 101 will not appear.***

101A Install timeclock on HVAC system

101B Install timeclock on building heating system

101C Install timeclock on domestic hot water system

MECHANICAL CHILLERS AND COMPRESSORS

27 Chiller Replacement/Derate

As time passes and use patterns change, the load imposed on mechanical chillers is often subject to change. This ECO requires review of chiller load and capacity to determine if energy may be saved by either chiller replacement or derating through modification.

28 Reclaim Heat from Refrigeration Equipment

Refrigeration equipment produces 2 to 4 times as much heat as is absorbed in the refrigeration process. This source of heat can often be captured and put to use in space heating.

29 Variable Speed Chiller Compressor

As time passes and use patterns change, the load imposed on mechanical chillers is often subject to change. If the current load is subject to fluctuations, it is fre-

quently found to be economical to vary the speed of the chiller compressor to more accurately match the load.

30 Efficient Air Compressor System

It is often found that savings in energy and maintenance can make the replacement of several air compressors with a single machine economical.

MECHANICAL SPACE HEATING SYSTEMS

31 Replace Existing Heating System with Infrared Heaters

In many shop type environments, direct heating of occupants, at their work stations can be achieved with infrared heaters. This method of heating allows the space temperature to be significantly decreased (during winter months) while achieving a comfortable working environment for the occupants.

32 Use Thermal Storage

In cases where more waste heat may be recovered than can be economically used at the time of recovery, the use of thermal storage technologies may allow for economical energy savings.

33 Radiator Controls

In many buildings, particularly older buildings, thermostats are not provided in each perimeter room. Such lack of controls frequently causes over heating of many spaces, thus causing heat to be wasted during the heating season.

34 Night Setback/Setup Thermostats

In the past, thermostats that had setback/setup functions were very expensive or not available. Today such thermostats are relatively inexpensive and constitute appropriate and economical energy retrofit equipment.

35 Reduce Space Temperature During Winter

The controls on some heating systems, or the design of the heating system itself, do not allow the space temperature to be maintained at required set points during winter months.

36 Revise/Replace Heating Controls

In many buildings the method of control installation allows control conflicts between zones. In such in-

stances, it may be economically feasible to revise and/or replace these controls based upon energy savings.

MECHANICAL WATER HEATING SYSTEMS

37 Booster Water Heaters at Equipment

In some domestic hot water systems the system temperature may be reduced by adding one or two booster heaters at the point of hot water use.

40 Lower Domestic Hot Water Temperature

Savings can be realized by lowering the domestic hot water supply temperature since heat loss from the storage tank, supply piping and recirculation piping will be reduced. Often, it is not possible to simply lower the setpoint of the hot water generator. For example, the hot water generator may supply showers as well as kitchen facilities. The high temperature requirements of the kitchen would have to be supplied. This ECO investigates system modifications, if any, that are required in order to be able to reduce the domestic hot water supply temperature.

41 Use Heat Pump to Heat Domestic Water

When a source of waste heat is available, it is some times economically feasible to move the waste heat with a heat pump to water heating temperature.

42 Reclaim Heat from Wash Water

Heat contained in spent wash water may some times be economically recovered and used to heat fresh rinse or wash water.

43 Cold Wash Water

In some applications, washing tasks may be accomplished with cold water.

44 Shut off Energy to Hot Water Off Use

When domestic hot water systems are not programmed for use for an extended period of time (hours), it may be economically feasible to shut the system down to reduce heat loss as well as save pumping energy.

45 Piping Insulation

Some domestic hot water and hydronic building heating systems have been installed with inadequate insulation or no insulation at all.

ELECTRICAL SYSTEMS

47 Replace Standard Fluorescent Ballasts

Standard magnetic ballasts lose significant amounts of electrical energy within the ballast. This ECO suggests the replacement of these standard ballasts with very high efficiency electronic ballasts.

48 Replace Standard Fluorescent Lamps

Standard fluorescent lamps, 40 watt rapid start lamps being the most common, have been improved with equal or higher lamp output for lower lamp wattages. This ECO suggests replacing existing standard lamps with an equivalent energy saving lamp equivalent to General Electric's Wattmiser II lamps.

49 Reduce Lighting Levels

Lighting level reductions in areas of very high illumination can yield energy savings. This ECO addresses reducing lighting levels to recommended levels. ECOs 50 and 51 also address over illuminated areas as part of incandescent replacements.

50 Replace Incandescents System with Fluorescents

As a lighting source, incandescent fixtures have generally low light output for power supplied to the fixture. This ECO addresses replacing inefficient incandescent fixtures with new fluorescent fixtures in office and standard height ceiling areas. See ECO 51 for high ceiling areas.

51 Replace Incandescents System with HPS

As a lighting source, incandescent fixtures have generally low light output for power supplied to the fixture. This ECO addresses replacing inefficient incandescent fixtures with new High Pressure Sodium (HPS) fixtures in high bay areas where color rendition is not a critical factor.

52 Install Time Clocks

When power for a specific application is only required during specific periods of the day, week or month, a time clock installed to regulate these hours is a possibility. This ECO addresses installing time clocks to control different functions within a facility. This ECO applies only to electrical items, see ECO 34 Night Setback, for heating applications of time clocks.

53 Occupancy Sensors for Lighting Control

In individual or small office spaces, lights are generally left on during lunch, breaks and other periods during the day when these spaces are unoccupied. This ECO suggests occupancy sensors be installed in offices to turn the lights within the space off during times when the room is not occupied.

54 Replace Existing Motors with Energy Efficient Motors

Standard motors are not always designed to the most energy efficient standards for initial cost considerations. This ECO addresses the replacement of these standard motors with new energy efficient motors.

MAINTENANCE SYSTEMS

55 Optimize Laundry Operations

Over time, fabrics have changed and efficient laundry equipment has been developed. This ECO has to do with the energy analysis associated with improving the operation of the laundry by modifying or replacing existing equipment and/or noting improvements in operations which could reduce energy consumption.

56 Optimize Dining Operations

As tastes have changed and thus cooking processes, more efficient kitchen equipment has been developed. This ECO has to do with the energy analysis associated with improving dining hall operations by modifying or replacing existing equipment and/or systems.

57 Optimize Steam/Condensate System Operations

As systems grow in size and complexity, demand upon the steam systems change. Furthermore, some steam system components may have deteriorated with time in service. This ECO has to do with the energy analysis associated with improving the operation of the steam and condensate return systems.

58 Balance HVAC System

As time passes and building programs change, the HVAC system is not always adjusted to accommodate new conditions. This ECO has to do with the energy analysis associated with improving facility operation through rebalancing the building's heating and ventilation system.

59 Improve Refrigerator Maintenance

Proper refrigerator maintenance can significantly prolong the life of the equipment. Equipment life can be reduced if heat is not properly rejected from the space, if the coils are not cleaned regularly, if strainers are not cleaned on a regular basis or if operating cycles are too short. This ECO will look at these maintenance elements.

60 Shut Down Steam System During Non-Use

In operations where steam is used in processes such as laundries and kitchens, it may be economically feasible and energy conservative to shut such systems down during periods when the process is not in operation.

61 Correct Condensate Return Pipe Size

The condensate return system is two phase (steam and condensate) and multiple pressure (pumped and gravity returns). In order for steam traps to function properly and thus enable the heat transfer equipment to operate efficiently it is important that the condensate return line have sufficient carrying capacity.

62 Steam Traps

The steam trap is of paramount importance in insuring that the latent heat of the steam is given up in the heat transfer equipment. There are a variety of trap designs, each with its proper application. This ECO will evaluate the energy costs associated with steam trap maintenance and note the applicability of the various traps observed in the facilities chosen for analysis.

5.2 Recommended ECOs

Table 5, Recommended ECOs, correlates individual buildings to recommended ECOs. Table 6 provides supplemental information in the form a listing of the ECO number and name, building number and name, Savings to Investment Ratio (SIR), Simple Payback (SP) and Construction Working Estimate (CWE) as of the analysis base year of FY87, all ranked according to decreasing SIR. As in the case of investigated ECOs, more ECOs are recommended in Table 6 than are indicated in Table 5 due to additional sub-sets of ECOs.

TABLE 5
Recommended ECOs Summary
Fort Richardson

ECO Number

Building	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1	●																										
5									●											●							
56	●																			●							
600D	●		●											●												●	
602A	●																										
602D	●																										
620																	●			●							
622																	●			●							
624																	●			●							
626	●																										
628	●																										
630	●																										
632																	●										
640A																	●			●							
640D																											
650A	●																●										
650D	●																										
655	●																										
658	●																			●							
660																	●			●							
662																	●			●							
664	●																			●							
666	●																			●							
668	●																										
670	●																			●							
690	●																●										
724	●																			●							
726	●																										
740	●																										
760	●																										
784																											
802	●																										
804																											
808	●																			●							
908	●																										
47430	●																										
47431	●																										

Building	28	29	30	31	32	33	34	35	36	37	39	40	41	42	43	44	45	47	48	49	50	51	52	53	54	101
1							●									●								●		
5							●	●										●	●		●			●		
56																●	●							●		
600D							●										●	●	●							
602A																								●		
602D																		●	●							
620																										
622																										
624																										
626																										
628																										
630																										
632																										
640A																								●		
640D																		●	●							
650A																								●		
650D																		●	●							
655																										
658							●									●	●							●		
660						●																				
662						●																				
664						●											●									
666						●											●									
668						●											●									
670						●											●									
690							●									●					●			●		
724							●										●							●		
726							●						●				●		●		●					
740							●										●									
760							●										●									
784							●										●									
802							●										●							●		
804							●										●							●		
808							●														●			●		
908							●										●							●		
47430							●										●				●			●		
47431							●										●									

RECOMMENDED ECO'S

TABLE 6

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
1	20	HVAC controls-revise/repl	640A	EM BKS W/MESS	60.16	0.31	1,903
2	20	HVAC controls-revise/repl	724	GEN PURP WHS	40.17	0.36	946
3	34B	Night setback/setup therm	724	GEN PURP WHS	34.03	0.56	6,100
4	34	Night setback/setup therm	726	FIXED LAUNDRY	32.18	0.59	1,076
5	20	HVAC controls-revise/repl	622	EM BK W/O MESS	32.16	0.54	3,642
6	20	HVAC controls-revise/repl	624	EM BK W/O MESS	32.16	0.54	3,642
7	20	HVAC controls-revise/repl	620	EM BK W/O MESS	32.16	0.54	3,642
8	20	HVAC controls-revise/repl	660	EM BK W/O MESS	32.16	0.54	3,642
9	20	HVAC controls-revise/repl	662	EM BK W/O MESS	32.16	0.54	3,642
10	20	HVAC controls-revise/repl	658	GEN PURP ADMIN	32.16	0.54	3,642
11	20	HVAC controls-revise/repl	670	EM BK W/O MESS	32.16	0.54	3,642
12	20	HVAC controls-revise/repl	664	EM BK W/O MESS	32.16	0.54	3,642
13	20	HVAC controls-revise/repl	666	EM BK W/O MESS	32.16	0.54	3,642
14	20	HVAC controls-revise/repl	808	COLD STORE WHS	30.46	0.34	1,408
15	26	Economizer cycles	600D	EM BKS W/ MESS	30.13	0.62	1,903
16	35	Winter reduction space ht	5	COMMISSARY/PX	29.81	1.06	1,046
17	20E	HVAC controls-revise/repl	56	OPEN MESS OFF	26.61	0.70	2,481
18	20A	HVAC controls-revise/repl	5	COMMISSARY/PX	25.86	0.37	704
19	20D	HVAC controls-revise/repl	56	OPEN MESS OFF	16.72	1.12	2,481
20	34	Night setback/setup therm	760	VEH MAINT SHOP	9.04	2.53	4,403
21	34	Night setback/setup therm	784	VEH MAINT SHOP	9.04	2.53	4,403
22	34	Night setback/setup therm	740	FE MAINT SHOP	9.04	2.53	4,403
23	34	Night setback/setup therm	804	GEN PURP WHS	8.90	2.52	9,712
24	34	Night setback/setup therm	802	GEN PURP WHS	8.90	2.52	9,712
25	20D	HVAC controls-revise/repl	5	COMMISSARY/PX	8.39	1.14	704
26	20F	HVAC controls-revise/repl	56	OPEN MESS OFF	7.65	2.50	2,481
27	45F	Piping insulation	802	GEN PURP WHS	7.60	2.99	1,061
28	45F	Piping insulation	804	GEN PURP WHS	7.60	2.99	1,061
29	34	Night setback/setup therm	600D	EM BKS W/ MESS	7.03	3.03	1,076
30	20B	HVAC controls-revise/repl	5	COMMISSARY/PX	6.98	1.93	946
31	45C	Piping insulation	724	GEN PURP WHS	6.76	3.36	1,061
32	48	Fluorescent lamps-replace	600D	EM BKS W/ MESS	6.21	1.83	1,044
33	48	Fluorescent lamps-replace	640D	MESS ONLY-640	5.89	1.92	1,508
34	48	Fluorescent lamps-replace	602D	MESS ONLY-602	5.89	1.92	1,508
35	48	Fluorescent lamps-replace	650D	MESS ONLY-650	5.89	1.92	1,508
36	34	Night setback/setup therm	908	PRINT SHOP	4.82	4.75	2,153
37	20C	HVAC controls-revise/repl	56	OPEN MESS OFF	4.55	4.29	2,481
38	34	Night setback/setup therm	658	GEN PURP ADMIN	3.94	6.27	15,024
39	50	Incandenscents to fluor	690	FIELD HOUSE	3.84	2.86	14,649
40	34	Night setback/setup therm	690	FIELD HOUSE	3.60	6.90	7,176
41	34	Night setback/setup therm	47430	MNT HANGAR AV	3.33	7.69	9,329
42	34	Night setback/setup therm	47431	MNT HANGAR AV	3.24	7.97	10,764
43	17	Reclaim heat-ventilation	640A	EM BKS W/MESS	3.13	9.36	37,180

RECOMMENDED ECO'S

TABLE 6 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
44	34	Night setback/setup therm	1	ARMY HQ BLDG.	2.94	9.52	16,612
45	17	Reclaim heat-ventilation	622	EM BK W/O MESS	2.78	11.16	19,187
46	17	Reclaim heat-ventilation	620	EM BK W/O MESS	2.78	11.16	19,187
47	17	Reclaim heat-ventilation	624	EM BK W/O MESS	2.78	11.16	19,187
48	17	Reclaim heat-ventilation	660	EM BK W/O MESS	2.78	11.16	19,187
49	17	Reclaim heat-ventilation	662	EM BK W/O MESS	2.78	11.16	19,187
50	17	Reclaim heat-ventilation	632	EM BK W/O MESS	2.78	11.16	19,187
51	20B	HVAC controls-revise/repl	56	OPEN MESS OFF	2.64	7.68	2,481
52	09A	Refrigeration case seals	5	COMMISSARY/PX	2.45	1.68	374
53	50	Incandenscents to fluor	726	FIXED LAUNDRY	2.40	4.55	4,568
54	53A	Occup sensors-light contr	808	COLD STORE WHS	2.32	4.10	646
55	44	Hot water-off for no use	690	FIELD HOUSE	2.25	28.49	681
56	34	Night setback/setup therm	808	COLD STORE WHS	2.25	13.89	1,435
57	53	Occup sensors-light contr	690	FIELD HOUSE	2.23	4.28	968
58	20K	HVAC controls-revise/repl	56	OPEN MESS OFF	2.22	9.29	2,481
59	01B	Insulate walls & roof	760	VEH MAINT SHOP	2.21	10.26	5,546
60	50	Incandenscents to fluor	47430	MNT HANGAR AV	2.19	5.01	4,699
61	20A	HVAC controls-revise/repl	56	OPEN MESS OFF	2.15	9.61	2,481
62	44	Hot water-off for no use	658	GEN PURP ADMIN	2.06	6.84	681
63	47	Fluorescent Ballasts-repl	640D	MESS ONLY-640	2.03	5.51	10,266
64	47	Fluorescent Ballasts-repl	650D	MESS ONLY-650	2.03	5.51	10,266
65	47	Fluorescent Ballasts-repl	602D	MESS ONLY-602	2.03	5.51	10,266
66	50	Incandenscents to fluor	808	COLD STORE WHS	1.88	5.94	5,015
67	44	Hot water-off for no use	56	OPEN MESS OFF	1.87	52.59	681
68	53	Occup sensors-light contr	56	OPEN MESS OFF	1.87	5.03	85
69	45H	Piping insulation	664	EM BK W/O MESS	1.85	12.24	169
70	45H	Piping insulation	668	EM BK W/O MESS	1.85	12.24	169
71	45H	Piping insulation	670	EM BK W/O MESS	1.85	12.24	169
72	45H	Piping insulation	666	EM BK W/O MESS	1.85	12.24	169
73	14	Reclaim heat-kitchen exh	600D	EM BKS W/ MESS	1.82	18.24	25,607
74	33	Radiator controls	660	EM BK W/O MESS	1.79	18.92	15,409
75	33	Radiator controls	664	EM BK W/O MESS	1.79	18.92	15,409
76	33	Radiator controls	662	EM BK W/O MESS	1.79	18.92	15,409
77	33	Radiator controls	666	EM BK W/O MESS	1.79	18.92	15,409
78	33	Radiator controls	670	EM BK W/O MESS	1.79	18.92	15,409
79	33	Radiator controls	668	EM BK W/O MESS	1.79	18.92	15,409
80	44	Hot water-off for no use	1	ARMY HQ BLDG.	1.76	7.72	681
81	53	Occup sensors-light contr	724	GEN PURP WHS	1.71	5.58	4,519
82	17	Reclaim heat-ventilation	650A	EM BKS W/MESS	1.66	17.53	79,650
83	53	Occup sensors-light contr	1	ARMY HQ BLDG.	1.63	5.87	38,733
84	45H	Piping insulation	658	GEN PURP ADMIN	1.52	14.99	169
85	47	Fluorescent Ballasts-repl	600D	EM BKS W/ MESS	1.46	7.57	15,128
86	53B	Occup sensors-light contr	808	COLD STORE WHS	1.44	6.61	323

RECOMMENDED ECO'S

TABLE 6 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
87	45J	Piping insulation	56	OPEN MESS OFF	1.43	15.93	838
88	50	Incandenscents to fluor	5	COMMISSARY/PX	1.35	8.14	4,513
89	20J	HVAC controls-revise/repl	56	OPEN MESS OFF	1.32	16.94	2,481
90	53	Occup sensors-light contr	602A	EM BKS W/ MESS	1.30	7.33	5,340
91	53	Occup sensors-light contr	650A	EM BKS W/MESS	1.30	7.33	5,340
92	53	Occup sensors-light contr	640A	EM BKS W/MESS	1.30	7.33	5,340
93	45G	Piping insulation	600D	EM BKS W/ MESS	1.28	17.78	1,901
94	45H	Piping insulation	726	FIXED LAUNDRY	1.28	17.68	2,541
95	45H	Piping insulation	47430	MNT HANGAR AV	1.28	17.68	182
96	53	Occup sensors-light contr	908	PRINT SHOP	1.28	7.45	1,937
97	48	Fluorescent lamps-replace	5	COMMISSARY/PX	1.27	3.76	12,513
98	34	Night setback/setup therm	5	COMMISSARY/PX	1.25	55.47	3,588
99	41	Heat pump-domestic water	726	FIXED LAUNDRY	1.22	-74.03	56,877
100	17	Reclaim heat-ventilation	690	FIELD HOUSE	1.18	39.33	40,915
101	53A	Occup sensors-light contr	47430	MNT HANGAR AV	1.12	8.49	1,937
102	47	Fluorescent Ballasts-repl	5	COMMISSARY/PX	1.11	9.93	106,517
103	45D	Piping insulation	47431	MNT HANGAR AV	1.10	20.60	2,646
104	48	Fluorescent lamps-replace	726	FIXED LAUNDRY	1.08	4.43	256
105	45E	Piping insulation	784	VEH MAINT SHOP	1.08	20.94	3,675
106	45E	Piping insulation	760	VEH MAINT SHOP	1.08	20.94	3,675
107	45E	Piping insulation	740	FE MAINT SHOP	1.08	20.94	3,675
108	45C	Piping insulation	726	FIXED LAUNDRY	1.08	21.07	503
109	45D	Piping insulation	56	OPEN MESS OFF	1.07	21.28	1,450
110	01D	Insulate walls & roof	56	OPEN MESS OFF	1.06	21.48	169,636
111	45D	Piping insulation	908	PRINT SHOP	1.05	21.70	137
112	53	Occup sensors-light contr	5	COMMISSARY/PX	1.05	9.05	1,614
113	45G	Piping insulation	600D	EM BKS W/ MESS	1.04	21.93	1,184
114	53	Occup sensors-light contr	658	GEN PURP ADMIN	1.03	9.25	323
115	01B	Insulate walls & roof	666	EM BK W/O MESS	1.02	22.39	5,461
116	01B	Insulate walls & roof	664	EM BK W/O MESS	1.02	22.39	5,461
117	01B	Insulate walls & roof	668	EM BK W/O MESS	1.02	22.39	5,461
118	01B	Insulate walls & roof	670	EM BK W/O MESS	1.02	22.39	5,461
119	01B	Insulate walls & roof	658	GEN PURP ADMIN	1.01	22.39	2,991
120	01B	Insulate walls & roof	600D	EM BKS W/ MESS	1.01	22.40	7
121	01B	Insulate walls & roof	655	OPEN MESS NCO	1.01	22.39	2,620
122	01B	Insulate walls & roof	602D	MESS ONLY-602	1.01	22.39	2,646
123	01B	Insulate walls & roof	602A	EM BKS W/ MESS	1.01	22.39	5,461
124	01B	Insulate walls & roof	1	ARMY HQ BLDG.	1.01	22.39	10,408
125	01B	Insulate walls & roof	626	EM BK W/O MESS	1.01	22.39	5,461
126	01B	Insulate walls & roof	630	EM BK W/O MESS	1.01	22.39	5,461
127	01B	Insulate walls & roof	628	EM BK W/O MESS	1.01	22.39	5,461
128	01B	Insulate walls & roof	56	OPEN MESS OFF	1.01	22.39	4,920
129	01B	Insulate walls & roof	690	FIELD HOUSE	1.01	22.39	4,621

RECOMMENDED ECO'S

TABLE 6 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	SIR	SP	CWE (FY87)
130	01B	Insulate walls & roof	740	FE MAINT SHOP	1.01	22.39	5,546
131	01B	Insulate walls & roof	47431	MNT HANGAR AV	1.01	22.39	3,715
132	01B	Insulate walls & roof	808	COLD STORE WHS	1.01	22.39	8,107
133	01B	Insulate walls & roof	802	GEN PURP WHS	1.01	22.39	15,433
134	01B	Insulate walls & roof	724	GEN PURP WHS	1.01	22.39	3,128
135	01B	Insulate walls & roof	726	FIXED LAUNDRY	1.01	22.39	5,892
136	01B	Insulate walls & roof	908	PRINT SHOP	1.01	22.39	3,637
137	01B	Insulate walls & roof	47430	MNT HANGAR AV	1.01	22.39	3,493
138	01B	Insulate walls & roof	650D	MESS ONLY-650	1.01	22.39	2,646
139	53	Occup sensors-light contr	804	GEN PURP WHS	1.01	9.53	646
140	01B	Insulate walls & roof	650A	EM BKS W/MESS	1.01	22.39	5,461
141	53	Occup sensors-light contr	802	GEN PURP WHS	1.01	9.53	646
142	03A	Insulated panels	600D	EM BKS W/ MESS	1.00	22.68	9,905
143	45E	Piping insulation	47430	MNT HANGAR AV	1.00	22.67	1,129
144	53B	Occup sensors-light contr	47430	MNT HANGAR AV	1.00	9.53	968

5.3 Not Recommended ECOs

Table 7, Not Recommended ECOs, correlates individual buildings to ECOs not recommended for implementation and provides a key to the reasons these ECOs were rejected.

Table 8, is structured similarly to Table 6 except that it applies to those ECOs not recommended. It contains the ECO number and name, building number and name, and the reason the specific ECO was not recommended. As can be seen, some ECOs were rejected because corrective measures had already been installed, a design project was already in progress which addressed that ECO, or the ECO was not appropriate or not applicable to the building under study. Other ECOs which did not fall into that category were analyzed, but the economic analysis revealed that ECO implementation would not be cost effective. For those ECOs, the Savings to Investment Ratio (SIR) has also been included in the Table.

TABLE 7
Not Recommended ECOs Summary
Fort Richardson

ECO Number

Building	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1											NE									NA				NA		
5			NE		NE			NE			NE							NA								
56											NE						NE							IN		
600D		NE		NE		IN		NE		NE	NE	NA	NA		NA		NA				NA	NA	NA	NA	NA	
602A											DIP						IN			DIP				DIP		
602D		IN	NE	NE		NA		NE		NE	IN	NA	NA	NE	NA		NE				IN	NA	IN	NA	NA	IN
620																										
622																										
624																										
626											DIP									DIP				IN		
628											DIP									DIP				IN		
630											DIP									DIP				IN		
632																				DIP						
640A	NE										NE													DIP		
640D	NE	NE	NE	NE		NA		NE		NE	IN	NA	NA	NE	NA		NE				IN	NA	IN	NA	NA	IN
650A											DIP									IN				DIP		
650D		NE	NE	NE		NA		NE		NE	DIP	NA	NA	NE	NA		NE				IN	NA	IN	NA	NA	IN
655											NE													DIP		
658											NE													IN		
660																										
662																										
664											NE													IN		
666											NE													IN		
668											NE									IN				IN		
670											NE													IN		
690					IN						NE									NA				IN		
724					NE		NA				NE						NE							NA		
726		NE	NE		NE	IN				NA	NE					IN	NE		NE		NA	NA		NA		
740					NE		NA				NE						IN			NA				NA		
760					NE		NA				NE						IN			NA				NA		
784	NE				NE		NA				NE						IN			NA				NA		
802					IN		IN				NE									NA				NA		
804	NE				IN		IN				NE									NA				NA		
808					NA		IN				NE													NA		
908					NE		NA				NE									NA				NA		
47430					NE						NE									NA				NA		
47431					NE						NE									NA				NA		

Building	27	28	29	30	31	32	33	34	35	36	37	39	40	41	42	43	44	45	47	48	49	50	51	52	53	54	101
1	IN						IN											NE				NE	NA				IN
5		NA	NA							IN								NA					NA	NA			
56								NE														NA	NA				IN
600D					NA	NA					NE		NA	NA	NE		NA				NA	NA				NE	
602A							DIP											DIP									NA
602D					NA	NA		IN			IN		NA	NA	NE		NA	DIP			NA	NA				NE	
620							IN																				NA
622							IN																				NA
624							IN																				NA
626							DIP											DIP									NA
628							DIP											DIP									NA
630							DIP											DIP									NA
632							DIP																				NA
640A							DIP											DIP									NA
640D					NA	NA		IN			IN		IN	NA	NE		NA	IN			NA	NA				NE	
650A							DIP											DIP									NA
650D					NA	NA		IN			IN		NA	NA	NE		NA				NA	NA				NE	
655							DIP	IN										DIP									
658																						IN	NA				
660																											NA
662																											NA
664																											NA
666																											NA
668																											NA
670																											NA
690																		NA					IN				
724					NA												NE					IN	NA				
726				IN							NE	NE	NA		IN	NA			NE								
740					NE												NE					IN	NA		NA		
760					NE												NE					IN	NA		NA		
784					NE												NE					IN	NA		NA		
802					NA												NE					IN	IN				
804					NA												NE					IN	IN				
808		NE			NE												NE	NA					IN				
908					NA												NE					IN	NA				
47430					NE												NE						IN				
47431					NE												NE					IN	IN		NE		

Legend:
NE = ECO Not Economical
IN = ECO already installed.
NA = ECO Not applicable to this building
DIP = ECO implementation already under design

NOT RECOMMENDED ECO'S

TABLE 8

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
1	01A	Insulate walls & roof	1	ARMY HQ BLDG.	Not Economical	0.26
2	01D	Insulate walls & roof	1	ARMY HQ BLDG.	Not Economical	0.03
3	11A	Weather stripping/caulk	1	ARMY HQ BLDG.	Not Economical	0.62
4	11D	Weather stripping/caulk	1	ARMY HQ BLDG.	Not Economical	0.32
5	11E	Weather stripping/caulk	1	ARMY HQ BLDG.	Not Economical	0.91
6	20	HVAC controls-revise/repl	1	ARMY HQ BLDG.	Not Appropriate	
7	24	Duct insulation	1	ARMY HQ BLDG.	Not Appropriate	
8	27	Chiller-replace/derate	1	ARMY HQ BLDG.	Installed / Corrected	
9	33	Radiator controls	1	ARMY HQ BLDG.	Installed / Corrected	
10	45A	Piping insulation	1	ARMY HQ BLDG.	Not Appropriate	
11	45B	Piping insulation	1	ARMY HQ BLDG.	Not Economical	0.91
12	45D	Piping insulation	1	ARMY HQ BLDG.	Not Appropriate	
13	45H	Piping insulation	1	ARMY HQ BLDG.	Not Appropriate	
14	50	Incandenscents to fluor	1	ARMY HQ BLDG.	Not Economical	0.45
15	51	Incandenscents to HPS	1	ARMY HQ BLDG.	Not Appropriate	
16	101A	Install Time Clocks	1	ARMY HQ BLDG.	Installed / Corrected	
17	01A	Insulate walls & roof	47430	MNT HANGAR AV	Not Economical	0.38
18	01H	Insulate walls & roof	47430	MNT HANGAR AV	Not Economical	0.04
19	05	Prevent air stratificat'n	47430	MNT HANGAR AV	Not Economical	0.78
20	11A	Weather stripping/caulk	47430	MNT HANGAR AV	Not Economical	0.62
21	11D	Weather stripping/caulk	47430	MNT HANGAR AV	Not Economical	0.32
22	20	HVAC controls-revise/repl	47430	MNT HANGAR AV	Not Appropriate	
23	24	Duct insulation	47430	MNT HANGAR AV	Not Appropriate	
24	31	Infrared heaters	47430	MNT HANGAR AV	Not Economical	0.08
25	44	Hot water-off for no use	47430	MNT HANGAR AV	Not Economical	-0.37
26	45A	Piping insulation	47430	MNT HANGAR AV	Not Appropriate	
27	45D	Piping insulation	47430	MNT HANGAR AV	Not Appropriate	
28	51	Incandenscents to HPS	47430	MNT HANGAR AV	Installed / Corrected	
29	01A	Insulate walls & roof	47431	MNT HANGAR AV	Not Economical	0.04
30	01H	Insulate walls & roof	47431	MNT HANGAR AV	Not Economical	0.04
31	05	Prevent air stratificat'n	47431	MNT HANGAR AV	Not Economical	0.78
32	11A	Weather stripping/caulk	47431	MNT HANGAR AV	Not Economical	0.62
33	11E	Weather stripping/caulk	47431	MNT HANGAR AV	Not Economical	0.76
34	20	HVAC controls-revise/repl	47431	MNT HANGAR AV	Not Appropriate	
35	24	Duct insulation	47431	MNT HANGAR AV	Not Appropriate	
36	31	Infrared heaters	47431	MNT HANGAR AV	Not Economical	0.08
37	44	Hot water-off for no use	47431	MNT HANGAR AV	Not Economical	-0.66
38	45A	Piping insulation	47431	MNT HANGAR AV	Not Appropriate	
39	45F	Piping insulation	47431	MNT HANGAR AV	Not Appropriate	
40	50	Incandenscents to fluor	47431	MNT HANGAR AV	Installed / Corrected	
41	51	Incandenscents to HPS	47431	MNT HANGAR AV	Installed / Corrected	
42	53	Occup sensors-light contr	47431	MNT HANGAR AV	Not Economical	0.79
43	03A	Insulated panels	5	COMMISSARY/PX	Not Economical	0.92

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
44	03B	Insulated panels	5	COMMISSARY/PX	Not Economical	0.46
45	03C	Insulated panels	5	COMMISSARY/PX	Not Economical	0.47
46	05	Prevent air stratificat'n	5	COMMISSARY/PX	Not Economical	0.78
47	08	Air curtains	5	COMMISSARY/PX	Not Economical	0.00
48	09B	Refrigeration case seals	5	COMMISSARY/PX	Not Economical	0.64
49	11A	Weather stripping/caulk	5	COMMISSARY/PX	Not Economical	0.62
50	11B	Weather stripping/caulk	5	COMMISSARY/PX	Not Economical	0.40
51	11D	Weather stripping/caulk	5	COMMISSARY/PX	Not Economical	0.32
52	11E	Weather stripping/caulk	5	COMMISSARY/PX	Not Economical	0.58
53	18	Return air-refrig display	5	COMMISSARY/PX	Not Appropriate	
54	20C	HVAC controls-revise/repl	5	COMMISSARY/PX	Not Economical	0.96
55	20E	HVAC controls-revise/repl	5	COMMISSARY/PX	Installed / Corrected	
56	28	Reclaim heat-refrig equip	5	COMMISSARY/PX	Not Appropriate	
57	29	Variable spd chiller comp	5	COMMISSARY/PX	Not Appropriate	
58	36	Heating controls-rev/repl	5	COMMISSARY/PX	Installed / Corrected	
59	45A	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
60	45B	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
61	45C	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
62	45D	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
63	45E	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
64	45F	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
65	45G	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
66	45H	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
67	45I	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
68	45J	Piping insulation	5	COMMISSARY/PX	Not Appropriate	
69	51	Incandenscents to HPS	5	COMMISSARY/PX	Not Appropriate	
70	52	Time clocks - install	5	COMMISSARY/PX	Not Appropriate	
71	01A	Insulate walls & roof	56	OPEN MESS OFF	Not Economical	0.57
72	11A	Weather stripping/caulk	56	OPEN MESS OFF	Not Economical	0.62
73	11B	Weather stripping/caulk	56	OPEN MESS OFF	Not Economical	0.40
74	11E	Weather stripping/caulk	56	OPEN MESS OFF	Not Economical	0.57
75	17	Reclaim heat-ventilation	56	OPEN MESS OFF	Not Economical	0.84
76	20G	HVAC controls-revise/repl	56	OPEN MESS OFF	Not Economical	-0.00
77	20H	HVAC controls-revise/repl	56	OPEN MESS OFF	Not Economical	0.04
78	20I	HVAC controls-revise/repl	56	OPEN MESS OFF	Not Appropriate	
79	20L	HVAC controls-revise/repl	56	OPEN MESS OFF	Not Economical	0.50
80	20M	HVAC controls-revise/repl	56	OPEN MESS OFF	Installed / Corrected	
81	20N	HVAC controls-revise/repl	56	OPEN MESS OFF	Installed / Corrected	
82	24	Duct insulation	56	OPEN MESS OFF	Installed / Corrected	
83	34	Night setback/setup therm	56	OPEN MESS OFF	Not Economical	0.93
84	45A	Piping insulation	56	OPEN MESS OFF	Not Appropriate	
85	45B	Piping insulation	56	OPEN MESS OFF	Not Appropriate	
86	45G	Piping insulation	56	OPEN MESS OFF	Not Economical	0.92

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
87	50	Incandenscents to fluor	56	OPEN MESS OFF	Not Appropriate	
88	51	Incandenscents to HPS	56	OPEN MESS OFF	Not Appropriate	
89	101A	Install Time Clocks	56	OPEN MESS OFF	Installed / Corrected	
90	01A	Insulate walls & roof	600D	EM BKS W/ MESS	Not Economical	0.57
91	01D	Insulate walls & roof	600D	EM BKS W/ MESS	Not Economical	0.87
92	02A	Install double glazing	600D	EM BKS W/ MESS	Not Economical	0.22
93	04A	Reduce glass area	600D	EM BKS W/ MESS	Not Economical	0.22
94	06	Vestibules	600D	EM BKS W/ MESS	Installed / Corrected	
95	08	Air curtains	600D	EM BKS W/ MESS	Not Economical	-0.01
96	10	Personnel door stripping	600D	EM BKS W/ MESS	Not Economical	0.15
97	11A	Weather stripping/caulk	600D	EM BKS W/ MESS	Not Economical	0.62
98	11D	Weather stripping/caulk	600D	EM BKS W/ MESS	Not Economical	0.32
99	12	Solar film	600D	EM BKS W/ MESS	Not Appropriate	
100	13	Thermal storage	600D	EM BKS W/ MESS	Not Appropriate	
101	15	Reclaim heat-kitchen eq	600D	EM BKS W/ MESS	Not Appropriate	
102	17	Reclaim heat-ventilation	600D	EM BKS W/ MESS	Not Appropriate	
103	21	Upgrade HVAC equipment	600D	EM BKS W/ MESS	Not Appropriate	
104	22	Convert ventilation-VAV	600D	EM BKS W/ MESS	Not Appropriate	
105	23	Install kitchen make-up	600D	EM BKS W/ MESS	Not Appropriate	
106	24	Duct insulation	600D	EM BKS W/ MESS	Not Appropriate	
107	25	Kitchen hood fan-shut off	600D	EM BKS W/ MESS	Not Appropriate	
108	31	Infrared heaters	600D	EM BKS W/ MESS	Not Appropriate	
109	32	Thermal storage	600D	EM BKS W/ MESS	Not Appropriate	
110	37	Booster water heaters	600D	EM BKS W/ MESS	Not Economical	-0.33
111	40	Hot water temp - lower	600D	EM BKS W/ MESS	Not Appropriate	
112	41	Heat pump-domestic water	600D	EM BKS W/ MESS	Not Appropriate	
113	42	Reclaim heat - wash water	600D	EM BKS W/ MESS	Not Economical	0.70
114	44	Hot water-off for no use	600D	EM BKS W/ MESS	Not Appropriate	
115	45A	Piping insulation	600D	EM BKS W/ MESS	Not Appropriate	
116	45C	Piping insulation	600D	EM BKS W/ MESS	Not Appropriate	
117	45D	Piping insulation	600D	EM BKS W/ MESS	Not Appropriate	
118	45E	Piping insulation	600D	EM BKS W/ MESS	Not Appropriate	
119	49	Reduce lighting levels	600D	EM BKS W/ MESS	Not Appropriate	
120	50	Incandenscents to fluor	600D	EM BKS W/ MESS	Not Appropriate	
121	54	Motors-repl w/energy eff	600D	EM BKS W/ MESS	Not Economical	0.39
122	01A	Insulate walls & roof	602A	EM BKS W/ MESS	Not Economical	0.28
123	01D	Insulate walls & roof	602A	EM BKS W/ MESS	Not Economical	0.02
124	11	Weather stripping/caulk	602A	EM BKS W/ MESS	Design - in - Progress	
125	17	Reclaim heat-ventilation	602A	EM BKS W/ MESS	Installed / Corrected	
126	20	HVAC controls-revise/repl	602A	EM BKS W/ MESS	Design - in - Progress	
127	24	Duct insulation	602A	EM BKS W/ MESS	Design - in - Progress	
128	33	Radiator controls	602A	EM BKS W/ MESS	Design - in - Progress	
129	45	Piping insulation	602A	EM BKS W/ MESS	Design - in - Progress	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
130	101B	Install Time Clocks	602A	EM BKS W/ MESS	Design - in - Progress	
131	101C	Install Time Clocks	602A	EM BKS W/ MESS	Not Appropriate	
132	01A	Insulate walls & roof	602D	MESS ONLY-602	Not Economical	0.28
133	01D	Insulate walls & roof	602D	MESS ONLY-602	Not Economical	0.02
134	02A	install double glazing	602D	MESS ONLY-602	Installed / Corrected	
135	03A	Insulated panels	602D	MESS ONLY-602	Not Economical	0.92
136	04A	Reduce glass area	602D	MESS ONLY-602	Not Economical	0.22
137	06	Vestibules	602D	MESS ONLY-602	Not Appropriate	
138	08	Air curtains	602D	MESS ONLY-602	Not Economical	-0.01
139	10	Personnel door stripping	602D	MESS ONLY-602	Not Economical	0.15
140	11	Weather stripping/caulk	602D	MESS ONLY-602	Installed / Corrected	
141	12	Solar film	602D	MESS ONLY-602	Not Appropriate	
142	13	Thermal storage	602D	MESS ONLY-602	Not Appropriate	
143	14	Reclaim heat-kitchen exh	602D	MESS ONLY-602	Not Economical	0.82
144	15	Reclaim heat-kitchen eq	602D	MESS ONLY-602	Not Appropriate	
145	17	Reclaim heat-ventilation	602D	MESS ONLY-602	Not Economical	0.64
146	21	Upgrade HVAC equipment	602D	MESS ONLY-602	Installed / Corrected	
147	22	Convert ventilation-VAV	602D	MESS ONLY-602	Not Appropriate	
148	23	Install kitchen make-up	602D	MESS ONLY-602	Installed / Corrected	
149	24	Duct insulation	602D	MESS ONLY-602	Not Appropriate	
150	25	Kitchen hood fan-shut off	602D	MESS ONLY-602	Not Appropriate	
151	26	Economizer cycles	602D	MESS ONLY-602	Installed / Corrected	
152	31	Infrared heaters	602D	MESS ONLY-602	Not Appropriate	
153	32	Thermal storage	602D	MESS ONLY-602	Not Appropriate	
154	34	Night setback/setup therm	602D	MESS ONLY-602	Installed / Corrected	
155	37	Booster water heaters	602D	MESS ONLY-602	Installed / Corrected	
156	40	Hot water temp - lower	602D	MESS ONLY-602	Not Appropriate	
157	41	Heat pump-domestic water	602D	MESS ONLY-602	Not Appropriate	
158	42	Reclaim heat - wash water	602D	MESS ONLY-602	Not Economical	0.80
159	44	Hot water-off for no use	602D	MESS ONLY-602	Not Appropriate	
160	45	Piping insulation	602D	MESS ONLY-602	Design - in - Progress	
161	49	Reduce lighting levels	602D	MESS ONLY-602	Not Appropriate	
162	50	Incandenscents to fluor	602D	MESS ONLY-602	Not Appropriate	
163	54	Motors-repl w/energy eff	602D	MESS ONLY-602	Not Economical	0.35
164	33	Radiator controls	620	EM BK W/O MESS	Installed / Corrected	
165	101B	Install Time Clocks	620	EM BK W/O MESS	Not Appropriate	
166	101C	Install Time Clocks	620	EM BK W/O MESS	Not Appropriate	
167	33	Radiator controls	622	EM BK W/O MESS	Installed / Corrected	
168	101B	Install Time Clocks	622	EM BK W/O MESS	Not Appropriate	
169	101C	Install Time Clocks	622	EM BK W/O MESS	Not Appropriate	
170	33	Radiator controls	624	EM BK W/O MESS	Installed / Corrected	
171	101B	Install Time Clocks	624	EM BK W/O MESS	Not Appropriate	
172	101C	Install Time Clocks	624	EM BK W/O MESS	Not Appropriate	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
173	01A	Insulate walls & roof	626	EM BK W/O MESS	Not Economical	0.28
174	01D	Insulate walls & roof	626	EM BK W/O MESS	Not Economical	0.06
175	11	Weather stripping/caulk	626	EM BK W/O MESS	Design - in - Progress	
176	20	HVAC controls-revise/repl	626	EM BK W/O MESS	Design - in - Progress	
177	24	Duct insulation	626	EM BK W/O MESS	Installed / Corrected	
178	33	Radiator controls	626	EM BK W/O MESS	Design - in - Progress	
179	45	Piping insulation	626	EM BK W/O MESS	Design - in - Progress	
180	101A	Install Time Clocks	626	EM BK W/O MESS	Design - in - Progress	
181	101B	Install Time Clocks	626	EM BK W/O MESS	Design - in - Progress	
182	101C	Install Time Clocks	626	EM BK W/O MESS	Not Appropriate	
183	01A	Insulate walls & roof	628	EM BK W/O MESS	Not Economical	0.28
184	01D	Insulate walls & roof	628	EM BK W/O MESS	Not Economical	0.06
185	11	Weather stripping/caulk	628	EM BK W/O MESS	Design - in - Progress	
186	20	HVAC controls-revise/repl	628	EM BK W/O MESS	Design - in - Progress	
187	24	Duct insulation	628	EM BK W/O MESS	Installed / Corrected	
188	33	Radiator controls	628	EM BK W/O MESS	Design - in - Progress	
189	45	Piping insulation	628	EM BK W/O MESS	Design - in - Progress	
190	101A	Install Time Clocks	628	EM BK W/O MESS	Design - in - Progress	
191	101B	Install Time Clocks	628	EM BK W/O MESS	Design - in - Progress	
192	101C	Install Time Clocks	628	EM BK W/O MESS	Not Appropriate	
193	01A	Insulate walls & roof	630	EM BK W/O MESS	Not Economical	0.28
194	01D	Insulate walls & roof	630	EM BK W/O MESS	Not Economical	0.06
195	11	Weather stripping/caulk	630	EM BK W/O MESS	Design - in - Progress	
196	20	HVAC controls-revise/repl	630	EM BK W/O MESS	Design - in - Progress	
197	24	Duct insulation	630	EM BK W/O MESS	Installed / Corrected	
198	33	Radiator controls	630	EM BK W/O MESS	Design - in - Progress	
199	45	Piping insulation	630	EM BK W/O MESS	Design - in - Progress	
200	101A	Install Time Clocks	630	EM BK W/O MESS	Design - in - Progress	
201	101B	Install Time Clocks	630	EM BK W/O MESS	Design - in - Progress	
202	101C	Install Time Clocks	630	EM BK W/O MESS	Not Appropriate	
203	20	HVAC controls-revise/repl	632	EM BK W/O MESS	Design - in - Progress	
204	33	Radiator controls	632	EM BK W/O MESS	Design - in - Progress	
205	101A	Install Time Clocks	632	EM BK W/O MESS	Design - in - Progress	
206	101B	Install Time Clocks	632	EM BK W/O MESS	Not Appropriate	
207	101C	Install Time Clocks	632	EM BK W/O MESS	Not Appropriate	
208	01A	Insulate walls & roof	640A	EM BKS W/MESS	Not Economical	0.28
209	01D	Insulate walls & roof	640A	EM BKS W/MESS	Not Economical	0.02
210	11A	Weather stripping/caulk	640A	EM BKS W/MESS	Not Economical	0.62
211	11D	Weather stripping/caulk	640A	EM BKS W/MESS	Not Economical	0.32
212	24	Duct insulation	640A	EM BKS W/MESS	Design - in - Progress	
213	33	Radiator controls	640A	EM BKS W/MESS	Design - in - Progress	
214	45	Piping insulation	640A	EM BKS W/MESS	Design - in - Progress	
215	101B	Install Time Clocks	640A	EM BKS W/MESS	Design - in - Progress	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
216	101C	Install Time Clocks	640A	EM BKS W/MESS	Not Appropriate	
217	01A	Insulate walls & roof	640D	MESS ONLY-640	Not Economical	0.28
218	01D	Insulate walls & roof	640D	MESS ONLY-640	Not Economical	0.02
219	02A	install double glazing	640D	MESS ONLY-640	Not Economical	0.22
220	03C	Insulated panels	640D	MESS ONLY-640	Not Economical	0.47
221	04A	Reduce glass area	640D	MESS ONLY-640	Not Economical	0.22
222	06	Vestibules	640D	MESS ONLY-640	Not Appropriate	
223	08	Air curtains	640D	MESS ONLY-640	Not Economical	-0.01
224	10	Personnel door stripping	640D	MESS ONLY-640	Not Economical	0.15
225	11	Weather stripping/caulk	640D	MESS ONLY-640	Installed / Corrected	
226	12	Solar film	640D	MESS ONLY-640	Not Appropriate	
227	13	Thermal storage	640D	MESS ONLY-640	Not Appropriate	
228	14	Reclaim heat-kitchen exh	640D	MESS ONLY-640	Not Economical	0.82
229	15	Reclaim heat-kitchen eq	640D	MESS ONLY-640	Not Appropriate	
230	17	Reclaim heat-ventilation	640D	MESS ONLY-640	Not Economical	0.64
231	21	Upgrade HVAC equipment	640D	MESS ONLY-640	Installed / Corrected	
232	22	Convert ventilation-VAV	640D	MESS ONLY-640	Not Appropriate	
233	23	Install kitchen make-up	640D	MESS ONLY-640	Installed / Corrected	
234	24	Duct insulation	640D	MESS ONLY-640	Not Appropriate	
235	25	Kitchen hood fan-shut off	640D	MESS ONLY-640	Not Appropriate	
236	26	Economizer cycles	640D	MESS ONLY-640	Installed / Corrected	
237	31	Infrared heaters	640D	MESS ONLY-640	Not Appropriate	
238	32	Thermal storage	640D	MESS ONLY-640	Not Appropriate	
239	34	Night setback/setup therm	640D	MESS ONLY-640	Installed / Corrected	
240	37	Booster water heaters	640D	MESS ONLY-640	Installed / Corrected	
241	40	Hot water temp - lower	640D	MESS ONLY-640	Installed / Corrected	
242	41	Heat pump-domestic water	640D	MESS ONLY-640	Not Appropriate	
243	42	Reclaim heat - wash water	640D	MESS ONLY-640	Not Economical	0.80
244	44	Hot water-off for no use	640D	MESS ONLY-640	Not Appropriate	
245	45	Piping insulation	640D	MESS ONLY-640	Installed / Corrected	
246	49	Reduce lighting levels	640D	MESS ONLY-640	Not Appropriate	
247	50	Incandenscents to fluor	640D	MESS ONLY-640	Not Appropriate	
248	54	Motors-repl w/energy eff	640D	MESS ONLY-640	Not Economical	0.35
249	01A	Insulate walls & roof	650A	EM BKS W/MESS	Not Economical	0.28
250	01D	Insulate walls & roof	650A	EM BKS W/MESS	Not Economical	0.02
251	11	Weather stripping/caulk	650A	EM BKS W/MESS	Design - in - Progress	
252	20	HVAC controls-revise/repl	650A	EM BKS W/MESS	Installed / Corrected	
253	24	Duct insulation	650A	EM BKS W/MESS	Design - in - Progress	
254	33	Radiator controls	650A	EM BKS W/MESS	Design - in - Progress	
255	45	Piping insulation	650A	EM BKS W/MESS	Design - in - Progress	
256	101B	Install Time Clocks	650A	EM BKS W/MESS	Design - in - Progress	
257	101C	Install Time Clocks	650A	EM BKS W/MESS	Not Appropriate	
258	01A	Insulate walls & roof	650D	MESS ONLY-650	Not Economical	0.28

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
259	01D	Insulate walls & roof	650D	MESS ONLY-650	Not Economical	0.02
260	02A	Install double glazing	650D	MESS ONLY-650	Not Economical	0.22
261	03A	Insulated panels	650D	MESS ONLY-650	Not Economical	0.92
262	04A	Reduce glass area	650D	MESS ONLY-650	Not Economical	0.22
263	06	Vestibules	650D	MESS ONLY-650	Not Appropriate	
264	08	Air curtains	650D	MESS ONLY-650	Not Economical	-0.01
265	10	Personnel door stripping	650D	MESS ONLY-650	Not Economical	0.15
266	11	Weather stripping/caulk	650D	MESS ONLY-650	Design - in - Progress	
267	12	Solar film	650D	MESS ONLY-650	Not Appropriate	
268	13	Thermal storage	650D	MESS ONLY-650	Not Appropriate	
269	14	Reclaim heat-kitchen exh	650D	MESS ONLY-650	Not Economical	0.82
270	15	Reclaim heat-kitchen eq	650D	MESS ONLY-650	Not Appropriate	
271	17	Reclaim heat-ventilation	650D	MESS ONLY-650	Not Economical	0.64
272	21	Upgrade HVAC equipment	650D	MESS ONLY-650	Installed / Corrected	
273	22	Convert ventilation-VAV	650D	MESS ONLY-650	Not Appropriate	
274	23	Install kitchen make-up	650D	MESS ONLY-650	Installed / Corrected	
275	24	Duct insulation	650D	MESS ONLY-650	Not Appropriate	
276	25	Kitchen hood fan-shut off	650D	MESS ONLY-650	Not Appropriate	
277	26	Economizer cycles	650D	MESS ONLY-650	Installed / Corrected	
278	31	Infrared heaters	650D	MESS ONLY-650	Not Appropriate	
279	32	Thermal storage	650D	MESS ONLY-650	Not Appropriate	
280	34	Night setback/setup therm	650D	MESS ONLY-650	Installed / Corrected	
281	37	Booster water heaters	650D	MESS ONLY-650	Installed / Corrected	
282	40	Hot water temp - lower	650D	MESS ONLY-650	Not Appropriate	
283	41	Heat pump-domestic water	650D	MESS ONLY-650	Not Appropriate	
284	42	Reclaim heat - wash water	650D	MESS ONLY-650	Not Economical	0.80
285	44	Hot water-off for no use	650D	MESS ONLY-650	Not Appropriate	
286	49	Reduce lighting levels	650D	MESS ONLY-650	Not Appropriate	
287	50	Incandenscents to fluor	650D	MESS ONLY-650	Not Appropriate	
288	54	Motors-repl w/energy eff	650D	MESS ONLY-650	Not Economical	0.35
289	01A	Insulate walls & roof	655	OPEN MESS NCO	Not Economical	0.08
290	01D	Insulate walls & roof	655	OPEN MESS NCO	Not Economical	0.06
291	11A	Weather stripping/caulk	655	OPEN MESS NCO	Not Economical	0.62
292	11B	Weather stripping/caulk	655	OPEN MESS NCO	Not Economical	0.40
293	11E	Weather stripping/caulk	655	OPEN MESS NCO	Not Economical	0.58
294	24	Duct insulation	655	OPEN MESS NCO	Design - in - Progress	
295	33	Radiator controls	655	OPEN MESS NCO	Design - in - Progress	
296	34	Night setback/setup therm	655	OPEN MESS NCO	Installed / Corrected	
297	45	Piping insulation	655	OPEN MESS NCO	Design - in - Progress	
298	01A	Insulate walls & roof	658	GEN PURP ADMIN	Not Economical	0.28
299	01D	Insulate walls & roof	658	GEN PURP ADMIN	Not Economical	0.06
300	11A	Weather stripping/caulk	658	GEN PURP ADMIN	Not Economical	0.62
301	11D	Weather stripping/caulk	658	GEN PURP ADMIN	Not Economical	0.32

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
302	11E	Weather stripping/caulk	658	GEN PURP ADMIN	Not Economical	Ø.91
303	24	Duct insulation	658	GEN PURP ADMIN	Installed / Corrected	
304	45A	Piping insulation	658	GEN PURP ADMIN	Not Appropriate	
305	45D	Piping insulation	658	GEN PURP ADMIN	Not Appropriate	
306	5Ø	Incandenscents to fluor	658	GEN PURP ADMIN	Installed / Corrected	
307	51	Incandenscents to HPS	658	GEN PURP ADMIN	Not Appropriate	
308	1Ø1B	Install Time Clocks	66Ø	EM BK W/O MESS	Not Appropriate	
309	1Ø1C	Install Time Clocks	66Ø	EM BK W/O MESS	Not Appropriate	
310	1Ø1B	Install Time Clocks	662	EM BK W/O MESS	Not Appropriate	
311	1Ø1C	Install Time Clocks	662	EM BK W/O MESS	Not Appropriate	
312	Ø1A	Insulate walls & roof	664	EM BK W/O MESS	Not Economical	Ø.28
313	Ø1D	Insulate walls & roof	664	EM BK W/O MESS	Not Economical	Ø.Ø6
314	11A	Weather stripping/caulk	664	EM BK W/O MESS	Not Economical	Ø.62
315	11B	Weather stripping/caulk	664	EM BK W/O MESS	Not Economical	Ø.4Ø
316	11D	Weather stripping/caulk	664	EM BK W/O MESS	Not Economical	Ø.32
317	11E	Weather stripping/caulk	664	EM BK W/O MESS	Not Economical	Ø.92
318	24	Duct insulation	664	EM BK W/O MESS	Installed / Corrected	
319	45A	Piping insulation	664	EM BK W/O MESS	Not Appropriate	
32Ø	45D	Piping insulation	664	EM BK W/O MESS	Not Appropriate	
321	1Ø1B	Install Time Clocks	664	EM BK W/O MESS	Not Appropriate	
322	1Ø1C	Install Time Clocks	664	EM BK W/O MESS	Not Appropriate	
323	Ø1A	Insulate walls & roof	666	EM BK W/O MESS	Not Economical	Ø.28
324	Ø1D	Insulate walls & roof	666	EM BK W/O MESS	Not Economical	Ø.Ø6
325	11A	Weather stripping/caulk	666	EM BK W/O MESS	Not Economical	Ø.62
326	11B	Weather stripping/caulk	666	EM BK W/O MESS	Not Economical	Ø.4Ø
327	11D	Weather stripping/caulk	666	EM BK W/O MESS	Not Economical	Ø.32
328	11E	Weather stripping/caulk	666	EM BK W/O MESS	Not Economical	Ø.92
329	24	Duct insulation	666	EM BK W/O MESS	Installed / Corrected	
33Ø	45A	Piping insulation	666	EM BK W/O MESS	Not Appropriate	
331	45D	Piping insulation	666	EM BK W/O MESS	Not Appropriate	
332	1Ø1B	Install Time Clocks	666	EM BK W/O MESS	Not Appropriate	
333	1Ø1C	Install Time Clocks	666	EM BK W/O MESS	Not Appropriate	
334	Ø1A	Insulate walls & roof	668	EM BK W/O MESS	Not Economical	Ø.28
335	Ø1D	Insulate walls & roof	668	EM BK W/O MESS	Not Economical	Ø.Ø6
336	11A	Weather stripping/caulk	668	EM BK W/O MESS	Not Economical	Ø.62
337	11B	Weather stripping/caulk	668	EM BK W/O MESS	Not Economical	Ø.4Ø
338	11D	Weather stripping/caulk	668	EM BK W/O MESS	Not Economical	Ø.32
339	11E	Weather stripping/caulk	668	EM BK W/O MESS	Not Economical	Ø.92
34Ø	2Ø	HVAC controls-revise/repl	668	EM BK W/O MESS	Installed / Corrected	
341	24	Duct insulation	668	EM BK W/O MESS	Installed / Corrected	
342	45A	Piping insulation	668	EM BK W/O MESS	Not Appropriate	
343	45D	Piping insulation	668	EM BK W/O MESS	Not Appropriate	
344	1Ø1B	Install Time Clocks	668	EM BK W/O MESS	Not Appropriate	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
345	101C	Install Time Clocks	668	EM BK W/O MESS	Not Appropriate	
346	01A	Insulate walls & roof	670	EM BK W/O MESS	Not Economical	0.28
347	01D	Insulate walls & roof	670	EM BK W/O MESS	Not Economical	0.06
348	11A	Weather stripping/caulk	670	EM BK W/O MESS	Not Economical	0.62
349	11B	Weather stripping/caulk	670	EM BK W/O MESS	Not Economical	0.40
350	11D	Weather stripping/caulk	670	EM BK W/O MESS	Not Economical	0.32
351	11E	Weather stripping/caulk	670	EM BK W/O MESS	Not Economical	0.92
352	24	Duct insulation	670	EM BK W/O MESS	Installed / Corrected	
353	45A	Piping insulation	670	EM BK W/O MESS	Not Appropriate	
354	45D	Piping insulation	670	EM BK W/O MESS	Not Appropriate	
355	101B	Install Time Clocks	670	EM BK W/O MESS	Not Appropriate	
356	101C	Install Time Clocks	670	EM BK W/O MESS	Not Appropriate	
357	01A	Insulate walls & roof	690	FIELD HOUSE	Not Economical	0.33
358	01D	Insulate walls & roof	690	FIELD HOUSE	Not Economical	0.06
359	05	Prevent air stratificat'n	690	FIELD HOUSE	Installed / Corrected	
360	11A	Weather stripping/caulk	690	FIELD HOUSE	Not Economical	0.62
361	11D	Weather stripping/caulk	690	FIELD HOUSE	Not Economical	0.32
362	11E	Weather stripping/caulk	690	FIELD HOUSE	Not Economical	0.76
363	20	HVAC controls-revise/repl	690	FIELD HOUSE	Not Appropriate	
364	24	Duct insulation	690	FIELD HOUSE	Installed / Corrected	
365	45A	Piping insulation	690	FIELD HOUSE	Not Appropriate	
366	45G	Piping insulation	690	FIELD HOUSE	Not Appropriate	
367	51	Incandenscents to HPS	690	FIELD HOUSE	Installed / Corrected	
368	01A	Insulate walls & roof	724	GEN PURP WHS	Not Economical	0.26
369	01D	Insulate walls & roof	724	GEN PURP WHS	Not Economical	0.05
370	05	Prevent air stratificat'n	724	GEN PURP WHS	Not Economical	0.78
371	07	Loading dock seals	724	GEN PURP WHS	Not Appropriate	
372	11A	Weather stripping/caulk	724	GEN PURP WHS	Not Economical	0.62
373	11B	Weather stripping/caulk	724	GEN PURP WHS	Not Economical	0.40
374	11D	Weather stripping/caulk	724	GEN PURP WHS	Not Economical	0.32
375	17	Reclaim heat-ventilation	724	GEN PURP WHS	Not Economical	0.82
376	24	Duct insulation	724	GEN PURP WHS	Not Appropriate	
377	31	Infrared heaters	724	GEN PURP WHS	Not Appropriate	
378	34A	Night setback/setup therm	724	GEN PURP WHS	Not Economical	0.85
379	44	Hot water-off for no use	724	GEN PURP WHS	Not Economical	-1.17
380	45A	Piping insulation	724	GEN PURP WHS	Not Appropriate	
381	45B	Piping insulation	724	GEN PURP WHS	Not Appropriate	
382	50	Incandenscents to fluor	724	GEN PURP WHS	Installed / Corrected	
383	51	Incandenscents to HPS	724	GEN PURP WHS	Not Appropriate	
384	01A	Insulate walls & roof	726	FIXED LAUNDRY	Not Economical	0.08
385	01D	Insulate walls & roof	726	FIXED LAUNDRY	Not Economical	0.06
386	02B	install double glazing	726	FIXED LAUNDRY	Not Economical	0.24
387	03C	Insulated panels	726	FIXED LAUNDRY	Not Economical	0.47

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
388	05	Prevent air stratificat'n	726	FIXED LAUNDRY	Not Economical	0.78
389	06	Vestibules	726	FIXED LAUNDRY	Installed / Corrected	
390	10	Personnel door stripping	726	FIXED LAUNDRY	Not Appropriate	
391	11A	Weather stripping/caulk	726	FIXED LAUNDRY	Not Economical	0.62
392	11B	Weather stripping/caulk	726	FIXED LAUNDRY	Not Economical	0.40
393	11D	Weather stripping/caulk	726	FIXED LAUNDRY	Not Economical	0.32
394	11E	Weather stripping/caulk	726	FIXED LAUNDRY	Not Economical	0.76
395	16	Reclaim heat-laundry eq	726	FIXED LAUNDRY	Installed / Corrected	
396	17	Reclaim heat-ventilation	726	FIXED LAUNDRY	Not Economical	-0.35
397	19	Reclaim heat-dryer equipt	726	FIXED LAUNDRY	Not Economical	0.53
398	21	Upgrade HVAC equipment	726	FIXED LAUNDRY	Not Appropriate	
399	22	Convert ventilation-VAV	726	FIXED LAUNDRY	Not Appropriate	
400	24	Duct insulation	726	FIXED LAUNDRY	Not Appropriate	
401	30	Efficient air compressor	726	FIXED LAUNDRY	Installed / Corrected	
402	37	Booster water heaters	726	FIXED LAUNDRY	Not Economical	-0.32
403	39	Recycle rinse water-wash	726	FIXED LAUNDRY	Not Economical	-4.07
404	40	Hot water temp - lower	726	FIXED LAUNDRY	Not Appropriate	
405	42	Reclaim heat - wash water	726	FIXED LAUNDRY	Installed / Corrected	
406	43	Cold wash water	726	FIXED LAUNDRY	Not Appropriate	
407	45A	Piping insulation	726	FIXED LAUNDRY	Not Appropriate	
408	45G	Piping insulation	726	FIXED LAUNDRY	Not Economical	0.83
409	45H	Piping insulation	726	FIXED LAUNDRY	Not Economical	0.91
410	47	Fluorescent Ballasts-repl	726	FIXED LAUNDRY	Not Economical	0.93
411	01A	Insulate walls & roof	740	FE MAINT SHOP	Not Economical	0.43
412	01D	Insulate walls & roof	740	FE MAINT SHOP	Not Economical	0.06
413	05	Prevent air stratificat'n	740	FE MAINT SHOP	Not Economical	0.78
414	07	Loading dock seals	740	FE MAINT SHOP	Not Appropriate	
415	11A	Weather stripping/caulk	740	FE MAINT SHOP	Not Economical	0.62
416	11B	Weather stripping/caulk	740	FE MAINT SHOP	Not Economical	0.40
417	11E	Weather stripping/caulk	740	FE MAINT SHOP	Not Economical	0.76
418	17	Reclaim heat-ventilation	740	FE MAINT SHOP	Installed / Corrected	
419	20	HVAC controls-revise/repl	740	FE MAINT SHOP	Not Appropriate	
420	24	Duct insulation	740	FE MAINT SHOP	Not Appropriate	
421	31	Infrared heaters	740	FE MAINT SHOP	Not Economical	0.08
422	44	Hot water-off for no use	740	FE MAINT SHOP	Not Economical	0.73
423	45A	Piping insulation	740	FE MAINT SHOP	Not Appropriate	
424	45D	Piping insulation	740	FE MAINT SHOP	Not Appropriate	
425	50	Incandenscents to fluor	740	FE MAINT SHOP	Installed / Corrected	
426	51	Incandenscents to HPS	740	FE MAINT SHOP	Not Appropriate	
427	53	Occup sensors-light contr	740	FE MAINT SHOP	Not Appropriate	
428	01A	Insulate walls & roof	760	VEH MAINT SHOP	Not Economical	0.49
429	01D	Insulate walls & roof	760	VEH MAINT SHOP	Not Economical	0.06
430	05	Prevent air stratificat'n	760	VEH MAINT SHOP	Not Economical	0.78

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
431	07	Loading dock seals	760	VEH MAINT SHOP	Not Appropriate	
432	11A	Weather stripping/caulk	760	VEH MAINT SHOP	Not Economical	0.62
433	11E	Weather stripping/caulk	760	VEH MAINT SHOP	Not Economical	0.76
434	17	Reclaim heat-ventilation	760	VEH MAINT SHOP	Installed / Corrected	
435	20	HVAC controls-revise/repl	760	VEH MAINT SHOP	Not Appropriate	
436	24	Duct insulation	760	VEH MAINT SHOP	Not Appropriate	
437	31	Infrared heaters	760	VEH MAINT SHOP	Not Economical	0.08
438	44	Hot water-off for no use	760	VEH MAINT SHOP	Not Economical	-0.71
439	45A	Piping insulation	760	VEH MAINT SHOP	Not Appropriate	
440	45D	Piping insulation	760	VEH MAINT SHOP	Not Appropriate	
441	50	Incandenscents to fluor	760	VEH MAINT SHOP	Installed / Corrected	
442	51	Incandenscents to HPS	760	VEH MAINT SHOP	Not Appropriate	
443	53	Occup sensors-light contr	760	VEH MAINT SHOP	Not Appropriate	
444	01A	Insulate walls & roof	784	VEH MAINT SHOP	Not Economical	0.94
445	01B	Insulate walls & roof	784	VEH MAINT SHOP	Not Economical	0.57
446	01D	Insulate walls & roof	784	VEH MAINT SHOP	Not Economical	0.06
447	05	Prevent air stratificat'n	784	VEH MAINT SHOP	Not Economical	0.78
448	07	Loading dock seals	784	VEH MAINT SHOP	Not Appropriate	
449	11A	Weather stripping/caulk	784	VEH MAINT SHOP	Not Economical	0.62
450	11E	Weather stripping/caulk	784	VEH MAINT SHOP	Not Economical	0.76
451	17	Reclaim heat-ventilation	784	VEH MAINT SHOP	Installed / Corrected	
452	20	HVAC controls-revise/repl	784	VEH MAINT SHOP	Not Appropriate	
453	24	Duct insulation	784	VEH MAINT SHOP	Not Appropriate	
454	31	Infrared heaters	784	VEH MAINT SHOP	Not Economical	0.08
455	44	Hot water-off for no use	784	VEH MAINT SHOP	Not Economical	-0.59
456	45A	Piping insulation	784	VEH MAINT SHOP	Not Appropriate	
457	45D	Piping insulation	784	VEH MAINT SHOP	Not Appropriate	
458	50	Incandenscents to fluor	784	VEH MAINT SHOP	Installed / Corrected	
459	51	Incandenscents to HPS	784	VEH MAINT SHOP	Not Appropriate	
460	53	Occup sensors-light contr	784	VEH MAINT SHOP	Not Appropriate	
461	01A	Insulate walls & roof	802	GEN PURP WHS	Not Economical	0.23
462	01E	Insulate walls & roof	802	GEN PURP WHS	Not Economical	0.07
463	05	Prevent air stratificat'n	802	GEN PURP WHS	Installed / Corrected	
464	07	Loading dock seals	802	GEN PURP WHS	Installed / Corrected	
465	11A	Weather stripping/caulk	802	GEN PURP WHS	Not Economical	0.62
466	11D	Weather stripping/caulk	802	GEN PURP WHS	Not Economical	0.32
467	20	HVAC controls-revise/repl	802	GEN PURP WHS	Not Appropriate	
468	24	Duct insulation	802	GEN PURP WHS	Not Appropriate	
469	31	Infrared heaters	802	GEN PURP WHS	Not Appropriate	
470	44	Hot water-off for no use	802	GEN PURP WHS	Not Economical	-1.09
471	45A	Piping insulation	802	GEN PURP WHS	Not Appropriate	
472	50	Incandenscents to fluor	802	GEN PURP WHS	Installed / Corrected	
473	51	Incandenscents to HPS	802	GEN PURP WHS	Installed / Corrected	

NOT RECOMMENDED ECO'S

TABLE 8 (CONT'D.)

FORT: Richardson

	ECO NUMBER	ECO NAME	BLDG NUMBER	BLDG NAME	REASON	SIR
474	01A	Insulate walls & roof	804	GEN PURP WHS	Not Economical	0.23
475	01B	Insulate walls & roof	804	GEN PURP WHS	Not Economical	0.60
476	01E	Insulate walls & roof	804	GEN PURP WHS	Not Economical	0.07
477	05	Prevent air stratificat'n	804	GEN PURP WHS	Installed / Corrected	
478	07	Loading dock seals	804	GEN PURP WHS	Installed / Corrected	
479	11A	Weather stripping/caulk	804	GEN PURP WHS	Not Economical	0.62
480	11D	Weather stripping/caulk	804	GEN PURP WHS	Not Economical	0.32
481	20	HVAC controls-revise/repl	804	GEN PURP WHS	Not Appropriate	
482	24	Duct insulation	804	GEN PURP WHS	Not Appropriate	
483	31	Infrared heaters	804	GEN PURP WHS	Not Appropriate	
484	44	Hot water-off for no use	804	GEN PURP WHS	Not Economical	-1.09
485	45A	Piping insulation	804	GEN PURP WHS	Not Appropriate	
486	50	Incandenscents to fluor	804	GEN PURP WHS	Installed / Corrected	
487	51	Incandenscents to HPS	804	GEN PURP WHS	Installed / Corrected	
488	01A	Insulate walls & roof	808	COLD STORE WHS	Not Economical	0.33
489	01D	Insulate walls & roof	808	COLD STORE WHS	Not Economical	0.04
490	05	Prevent air stratificat'n	808	COLD STORE WHS	Not Appropriate	
491	07	Loading dock seals	808	COLD STORE WHS	Installed / Corrected	
492	11D	Weather stripping/caulk	808	COLD STORE WHS	Not Economical	0.32
493	24	Duct insulation	808	COLD STORE WHS	Not Appropriate	
494	28	Reclaim heat-refrig equip	808	COLD STORE WHS	Not Economical	0.18
495	31	Infrared heaters	808	COLD STORE WHS	Not Economical	0.08
496	44	Hot water-off for no use	808	COLD STORE WHS	Not Economical	-0.73
497	45A	Piping insulation	808	COLD STORE WHS	Not Appropriate	
498	45D	Piping insulation	808	COLD STORE WHS	Not Appropriate	
499	51	Incandenscents to HPS	808	COLD STORE WHS	Installed / Corrected	
500	01A	Insulate walls & roof	908	PRINT SHOP	Not Economical	0.05
501	01F	Insulate walls & roof	908	PRINT SHOP	Not Economical	0.06
502	01G	Insulate walls & roof	908	PRINT SHOP	Not Economical	0.25
503	05	Prevent air stratificat'n	908	PRINT SHOP	Not Economical	0.78
504	07	Loading dock seals	908	PRINT SHOP	Not Appropriate	
505	11A	Weather stripping/caulk	908	PRINT SHOP	Not Economical	0.62
506	11D	Weather stripping/caulk	908	PRINT SHOP	Not Economical	0.32
507	20	HVAC controls-revise/repl	908	PRINT SHOP	Not Appropriate	
508	24	Duct insulation	908	PRINT SHOP	Not Appropriate	
509	31	Infrared heaters	908	PRINT SHOP	Not Appropriate	
510	44	Hot water-off for no use	908	PRINT SHOP	Not Economical	-0.83
511	45A	Piping insulation	908	PRINT SHOP	Not Appropriate	
512	50	Incandenscents to fluor	908	PRINT SHOP	Installed / Corrected	
513	51	Incandenscents to HPS	908	PRINT SHOP	Not Appropriate	

5.4 ECIP Projects Developed

No projects eligible for ECIP funding were identified during the course of the study. This finding was due primarily to the minimum cost limit of $200,000 under ECIP.

5.5 Other Energy Programs Developed

Table 9, on the following page, provides a comprehensive summary of the developed projects, including the funding source and project title, analysis year (FY87) cost (construction plus SIOH), the annual electric and steam energy savings in KWHs, MBTUs and dollars, the net annual savings, SIR, simple amortization period (payback), and programmed year cost (construction plus SIOH). It should be noted that the net annual savings shown may differ from the energy savings. In those cases, this is due to increased (or decreased) maintenance costs associated with project implementation.

Four projects identified for development qualify under the Quick Return on Investment Program (QRIP) portion of the Productivity Capital Investment Program and appropriate documentation was developed. In addition, nine projects were identified which can qualify for OMA-L energy project funds and documentation for that program was also developed. No projects qualify for application of OSD Productivity Investment Funding (OSD PIF) nor Productivity Enhancing Capital Investment Program (PECIP) funds. Two Low Cost/No Cost Projects which the Director of Engineering and Housing can perform using his personnel were also identified.

QRIP and OMA-L project costs were escalated to an FY90 program year and include construction cost and SIOH, while Low Cost/No Cost project costs were developed for current year (FY89) implementation.

5.6 Operational or Policy Change Recommendations

Some key recommendations evolving from this study include:

a) Operations and maintenance systems now in place at Fort Richardson could be markedly improved through the investment in a comprehensive maintenance delivery system analysis and implementation of the recommendations that flow from such an analysis. Such an analysis should be truly comprehensive, including all aspects of the Fort's operations and maintenance systems to include accounting procedures, inventory control, warehousing, purchasing, staff training and analysis of maintenance service contracts.

b) A comprehensive analysis of operations at the laundry facility (Building 726). It is estimated that the effort required for an analysis of this depth would account for approximately 700 man-hours. If undertaken in conjunction with a similar study of the laundry at Fort Wainwright, the Fort Richardson element could be reduced because of economies of scale and similarity of facilities. This should include:

TABLE 9

Developed Projects Summary
Fort Richardson

Developed Project Funding Source and Description	FY 87 Project CWE and SIOH	Steam Energy Savings (MBTU)	Elect. Energy Savings (KWH)	Elect. Energy Savings (MBTU)	Annual Energy Savings ($)	Annual Net Savings ($)	FY87 Savings/ Investment Ratio	FY87 Simple Payback	QRIP FY90 Savings/ Investment Ratio	QRIP FY90 Simple Payback	Programmed Year Project Costs
QRIP PACKAGE #1: Energy - Economizer Cycles	2008	1257	0	0	3104	3104	30.13	0.62	17.19	0.46	2233 (1)
QRIP PACKAGE #2: Energy - Revise Controls	44307	27185	261450	892	79596	79396	32.31	0.53	18.83	0.42	49288 (1)
QRIP PACKAGE #3: Energy - PX HVAC Controls	2483	86	63388	216	3230	3020	13.04	0.78	8.92	0.89	2762 (1)
QRIP PACKAGE #4: Energy - Night Setback	6436	4667	0	0	11527	10932	34.03	0.56	19.11	0.42	7158 (1)
OMA-L PACKAGE #1: Replace Fluorescent Ballasts for Energy Conservation	48452	0	117766	402	5607	7615	1.84	6.05			53898 (1)
OMA-L PACKAGE #2: Incadescent to Fluorescent Lights for Energy Conserv.	30522	0	88088	301	4194	7938	3.00	3.66			33953 (1)
OMA-L PACKAGE #3: Hot Water Generation Control for Energy Conservation	1437	37	2062	7	188	189	1.91	7.24			1598 (1)
OMA-L PACKAGE #4: Night Setback Heating for Energy Conservation	83589	12911	0	0	31891	21613	6.26	3.68			92984 (1)
OMA-L PACKAGE #5: Pipe Insulation for Energy Conservation	3358	417	0	0	1031	1031	7.32	3.10			3736 (1)
OMA-L PACKAGE #6: Lighting Occupancy Sensors for Energy Conservation	66368	0	216167	738	10292	10292	1.55	6.13			73828 (1)
OMA-L PACKAGE #7: Replace PX Fluor. Ballasts for Energy Conservation	112375	0	128415	438	6114	10768	1.11	9.93			125006 (1)
OMA-L PACKAGE #8: Improve HVAC Controls for Energy Conservation	13087	1105	0	0	2729	2429	3.84	5.13			14558 (1)
OMA-L PACKAGE #9: Refrig Case Seals & Incand to Fluor Lights for Energy	5156	0	13127	45	625	779	1.44	6.30			5735 (1)
LOW COST/NO COST #1: Reduce Space Temperature in Winter	1104	697	0	0	1721	986	29.81	1.06			1128 (2)
LOW COST/NO COST #2: Replace Std Fluor Lamps w/ Energy Saving Lamps	19346	0	132342	452	6301	6301	2.79	2.86			19780 (2)

NOTES: (1) Programmed Year of FY90
(2) Programmed Year of FY89

1) Comprehensive process analysis to determine which of the existing equipment would be salvageable in new configurations and which should be changed out for new, modern energy and labor saving equipment. (On the basis of this study it was not possible to justify such replacement from purely energy savings, however, observations indicate that combined energy and labor savings may do so.)

2) Implementation study to determine how to process laundry while new equipment is being installed. This should include consideration of a new laundry facility versus complete renovation of the existing building and replacement of existing equipment.

3) Review of the contract between the Government and the operations contractor with particular attention to possible cost saving incentives.

c) Fort Richardson now generates its own electric power. It is recommended that the Government commission a study to determine the economic benefit of purchasing electric energy from the local electric power utility. Such a study would require a work effort of about 500 professional man-hours.

d) We recommend that the current stocks of fluorescent (Rapid and Instant Start) lamps and lighting fixture ballasts be liquidated and replaced with compatible energy efficient types as were used in our analysis of ECOs 47 and 48 (i.e., GE Watt-Miser lamps and Triad Utrad ballasts, or equivalent). Such an action would provide much more immediate energy savings since lamps and ballasts currently in operation would be replaced with the energy efficient type as they fail.

e) We recommend retrofit of existing 40 or 60 watt incandescent lamps in enclosed fixtures or exposed in low profile areas such as storage areas, with new PL Type lamps and adaptors similar to the General Electric Bias Adaptor System. In areas with over 400 hours use per year this retrofit yields an SIR greater than 1.0 and simple payback less than 10 years. For 1,000 hours use the SIR is 3.17 and simple payback is 3.42 years. A net maintenance savings of approximately $4.50 per 1,000 hours of lamp usage is realized by completing this retrofit operation due to the extended overall lamp life of 10,000 hours.

6. ENERGY AND COST SAVINGS

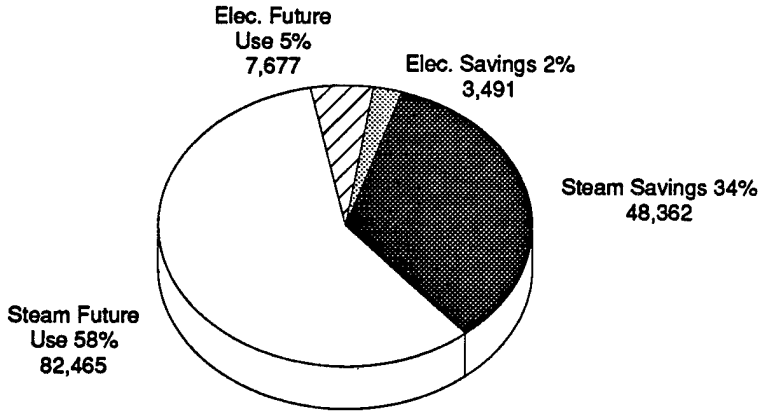
Figure 3, Developed Projects Annual Energy Savings, and Figure 4, Developed Projects Annual Cost Savings, summarize the result of implementation of developed ECOs. Figure 3 indicates that energy consumption will be reduced by 34% for the thermal energy systems analyzed, and 2% for electrical systems analyzed. Figure 4 reflects the dollar savings which would result through project implementation. These show that a total of 51,853 MBTUs and $168,150 would be saved annually through implementation of all developed projects.

Figures 5 through 10 graphically illustrate the energy and associated costs presently being used and the savings accountable to each developed project package.

FIGURE 3

Developed Projects Annual Energy Savings

Fort Richardson

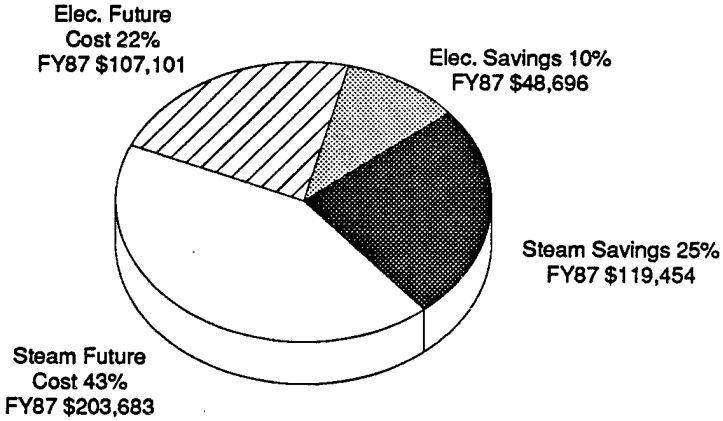


Total Savings : 51,853 MBTU/Year
Total Future Use: 90,142 MBTU/Year

FIGURE 4

Developed Projects Annual Cost Savings

Fort Richardson



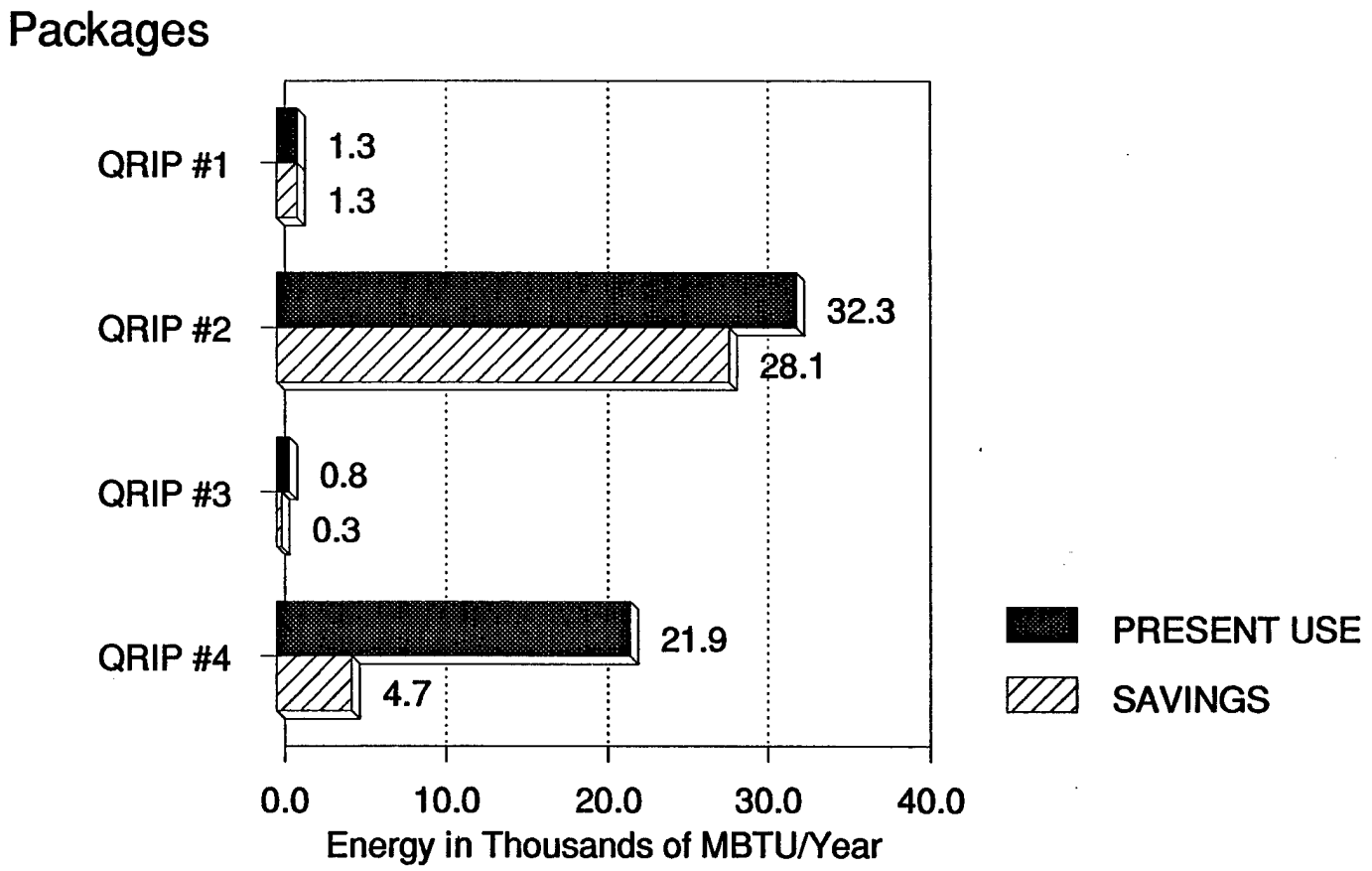
Total Savings : $168,150/Year (FY 1987)
Total Future Cost: $310,784/Year (FY 1987)

FPE 89

FIGURE 5

QRIP Funded Packages

Fort Richardson



Total Energy Savings: 34,303 MBTU/Year

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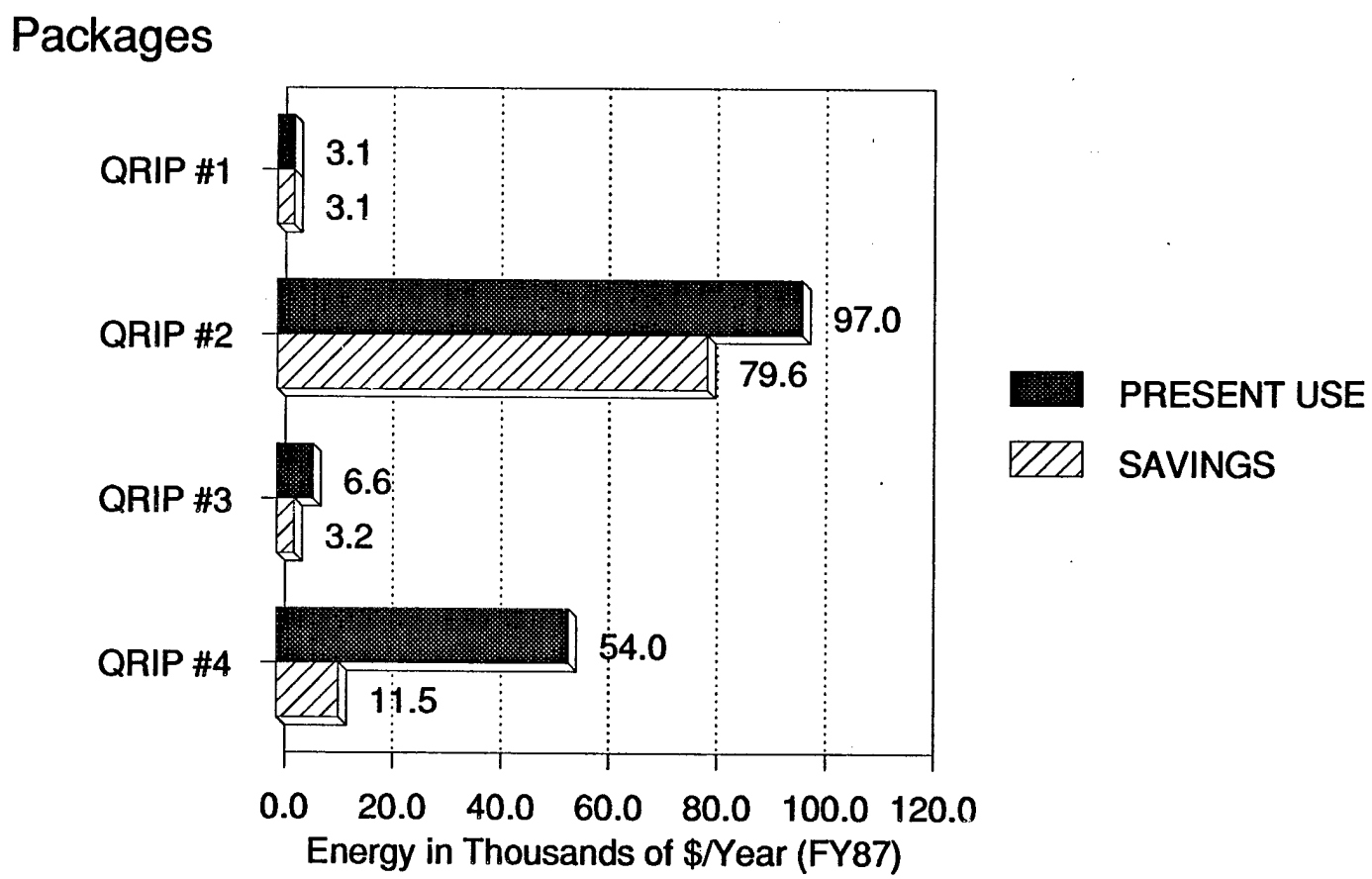
FIGURE 6

QRIP Funded Packages

Fort Richardson



Total Energy Cost Savings: $97,457/Year (FY 1987)

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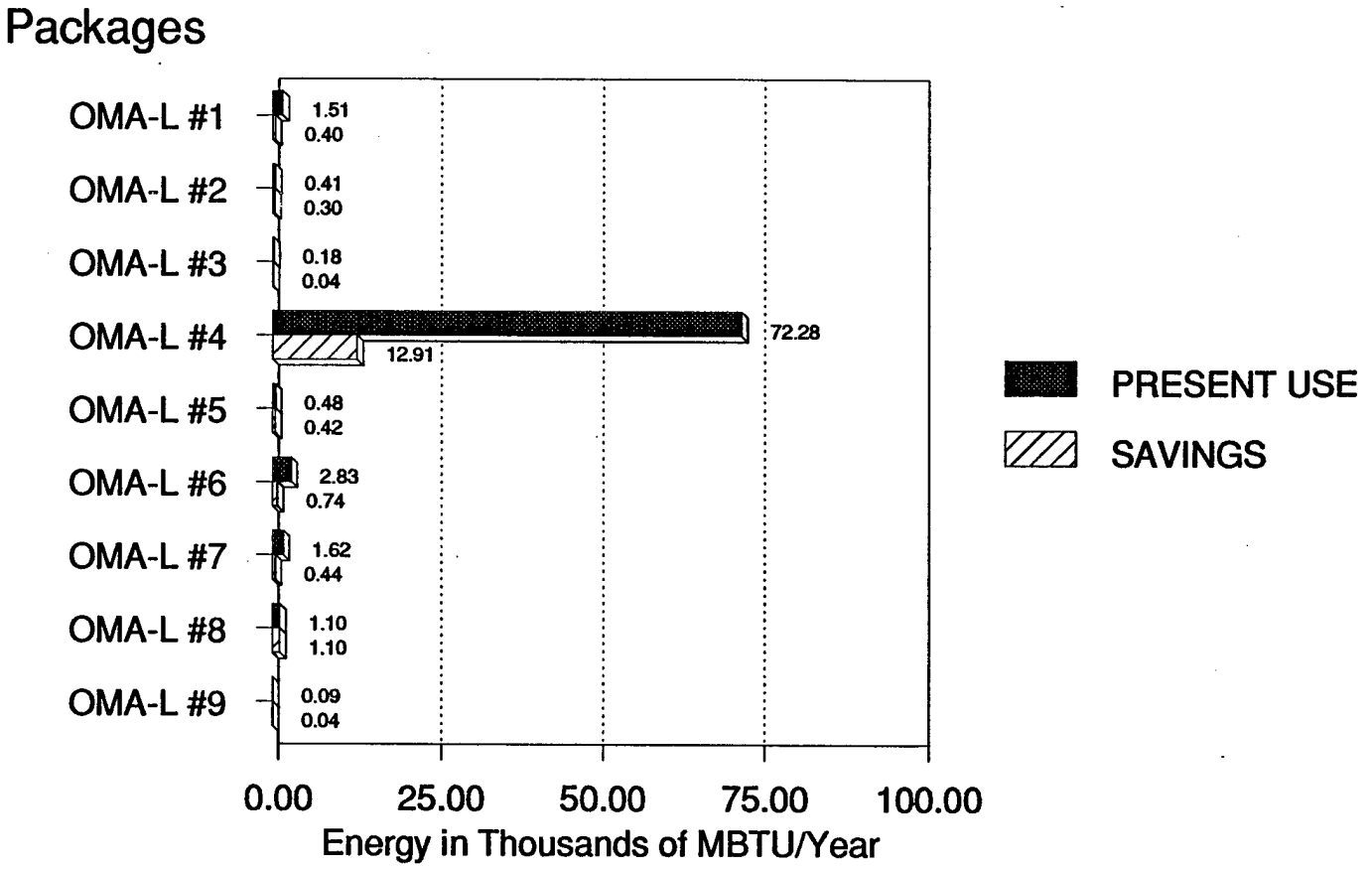
FIGURE 7

OMA-L Funded Packages

Fort Richardson



Total Energy Savings: 16,401 MBTU/Year

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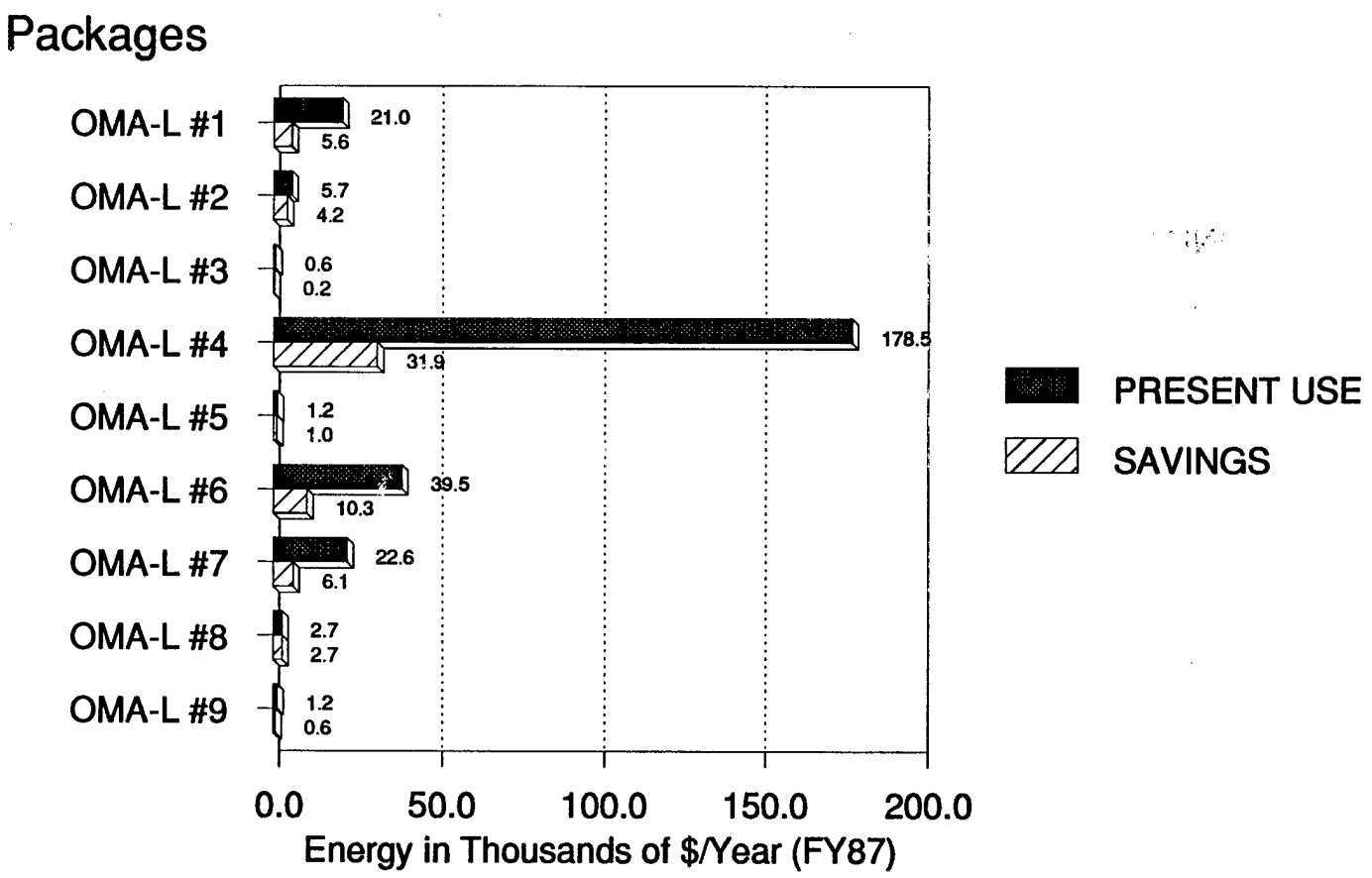
Figure 8

OMA-L Funded Packages

Fort Richardson



Total Energy Cost Savings: $62,671/Year (FY 1987)

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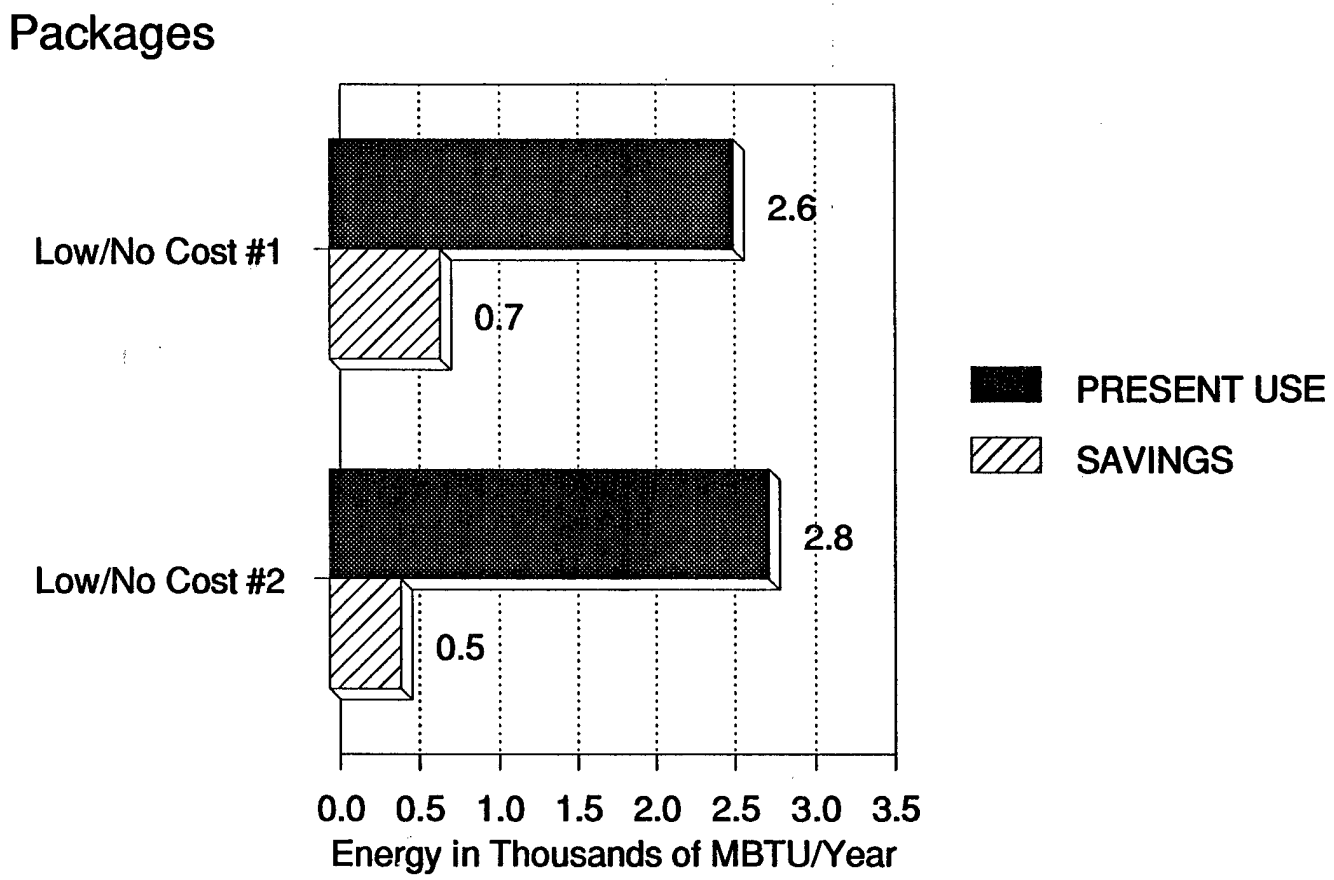
Figure 9

Low Cost/No Cost Packages

Fort Richardson



Total Energy Savings: 1,149 MBTU/Year

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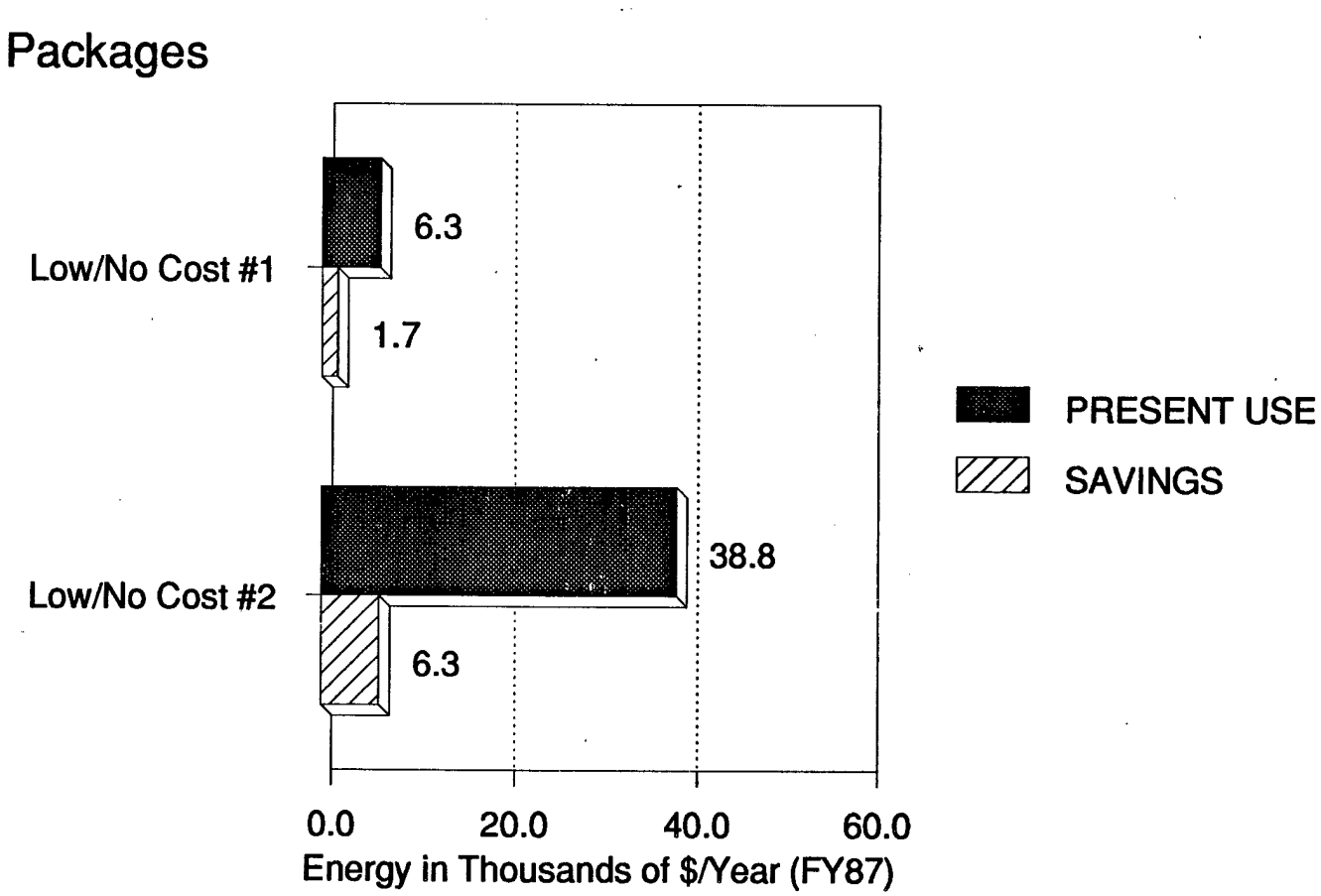
FIGURE 10

Low Cost/No Cost Packages

Fort Richardson



Total Energy Cost Savings: $8,022/Year (FY 1987)

FPE 89

7. ENERGY PLAN

Projects identified for development are eligible under QRIP and OMA-L program guidelines, and for Low Cost/No Cost implementation. None qualified for ECIP, PECIP or OSD PIF funds.

7.1 QRIP Projects

QRIP projects have been programmed for implementation during Fiscal Year 1990. It is anticipated that construction could begin in April 1990, with completion by August 1990. These projects are identified as follows:

TABLE 10. QRIP PROJECTS

PROJECT	S.I.R. (FY87)	S.I.R. (FY90)	FY90 COST ($)
QRIP PACKAGE #1: Energy - Economizer Cycles	30.13	17.19	2,233
QRIP PACKAGE #2: Energy - Revise Controls	32.31	18.83	49,288
QRIP PACKAGE #3: Energy - PX HVAC Controls	13.04	8.92	2,762
QRIP PACKAGE #4: Energy - Night Setback	34.03	19.11	7,158
TOTAL			61,441

7.2 OMA-L Energy Projects

OMA-L projects have been programmed for implementation during Fiscal Year 1990. It is anticipated that construction could begin in April 1990, with completion by August 1990. These projects are identified as follows:

TABLE 11. OMA-L PROJECTS

PROJECT	S.I.R.	FY90 COST ($)
OMA-L PACKAGE #1: Replace Fluorescent Ballasts for Energy Conservation	1.84	53,898
OMA-L PACKAGE #2: Incadescent to Fluorescent Lights for Energy Conserv.	3.00	33,953
OMA-L PACKAGE #3: Hot Water Generation Control for Energy Conservation	1.91	1,598
OMA-L PACKAGE #4: Night Setback Heating for Energy Conservation	6.26	92,984
OMA-L PACKAGE #5: Pipe Insulation for Energy Conservation	7.32	3,736
OMA-L PACKAGE #6: Lighting Occupancy Sensors for Energy Conservation	1.55	73,828
OMA-L PACKAGE #7: Replace PX Fluor. Ballasts for Energy Conservation	1.11	125,006
OMA-L PACKAGE #8: Improve HVAC Controls for Energy Conservation	3.84	14,558
OMA-L PACKAGE #9: Refrig Case Seals & Incand to Fluor Lights for Energy	1.44	5,735
TOTAL		405,296

7.3 Low Cost/No Cost Projects

The Low Cost/No Cost projects should be scheduled to be undertaken in the current Fiscal Year (FY89). These projects are identified as follows:

TABLE 12. LOW COST/NO COST PROJECTS

PROJECT	S.I.R.	FY89 COST ($)
LOW COST/NO COST #1: Reduce Space Temperature in Winter	29.81	1,128
LOW COST/NO COST #2: Replace Std Fluor Lamps w/ Energy Saving Lamps	2.79	19,780
TOTAL		20,908